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Vol. XV

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THE

KANSAS UNIVERSITY

# SCIENCE BULLETIN

VOL. XV, NO. 1—DECEMBER, 1924.

(Whole Series, Vol. XXV, No. 1.)

CONTENTS:

CONTRIBUTION TO A MONOGRAPH OF THE SYRPHIDÆ (DIPTERA) FROM NORTH OF MEXICO.....*C. Howard Curran.*

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THE KANSAS UNIVERSITY
SCIENCE BULLETIN

VOL. XV.] DECEMBER, 1924. [No. 1.

# Contribution to a Monograph of the American Syrphidæ from North of Mexico.*

C. HOWARD CURRAN,
Department of Entomology.

## INTRODUCTION.

IN PRESENTING this contribution to a monograph of the North American Syrphidæ it is realized that the subfamilies and genera dealt with in the present work have not been finally and fully considered. Undoubtedly many undescribed forms are at present in collections, while the territory covered by collectors has been exceedingly small considering the fact that the slightest change in topographical conditions may often yield a fauna differing in large degree from the usual fauna of the general area. It is recognized that there is a great deal to be done from the taxonomist's standpoint alone, not to mention the almost untouched fields of biological and ecological research, which present not only a difficult study, but at the same time one which should prove of the greatest interest and attraction and furnish information invaluable to a better understanding of the specific and generic relationships. In this first part of the work the biological and ecological sides are but briefly dealt with, such being left for inclusion with the description of the genera and species.

The object of the present work is to place the genera studied in such a position that additions to our fauna may be readily recognized and incorporated in the proposed complete monograph, the work for which has been under way for a number of years.

It might be interesting to set forth here a brief historical sketch of the work which has been done on this family of Diptera up to

* Submitted to the Department of Entomology and the faculty of the Graduate School of the University of Kansas in partial fulfillment of the requirements for the degree of Master of Science.

the present time, more especially by American students. While a great many of our species were originally described by European entomologists, whose descriptions must not be overlooked, practically all of their species have been recognized and redescribed or the descriptions repeated by American workers, and therefore these publications need not be discussed. In Harris's "Insects of New England" a great many manuscript names were published, but only a very few of the species were described under these names, hence the publication is of little interest. The first really important work was that of Say (1824-1834), in various journals of scientific organizations, and republished in their entirety in 1869. Loew's "Centuries," published in Germany, are extremely valuable, but almost unprocurable. The next work of importance was that of Baron Osten Sacken, and this was followed a few years later by Williston's "Synopsis of the North American Syrphidæ." This latter work is by far the most important contribution to our knowledge of the family which has been published to date, and has long been used as a basis for determinations. Considering the time at which it was published, the instruments used—a small hand lens and an ordinary oil lamp (Doctor Williston did practically all his work at night)—and the vague descriptions which were available, it must be considered an extraordinarily fine work. We have found certain discrepancies, brought out by an accumulation of specimens, and a few faulty associations of species, and yet these are remarkably few in number. In this synopsis are contained descriptions of about 350 species of Syrphidæ, not all from north of Mexico.

The publication of the "Synopsis" in 1886 greatly stimulated the study of this family, and since that time many additions to our fauna and biological data have been published. Among the more important of these are papers by W. A. Snow, W. D. Hunter, Raymond C. Osborn, James S. Hine, C. L. Metcalf, W. A. Robertson, A. L. Lovett, C. L. Fluke, C. R. Jones, P. R. Jones, W. M. Davidson, D. W. Coquillett, Raymond C. Shannon, Frederick Knab, and many others. The titles of these publications will be found in the bibliography. Also, at the time of writing, several other publications are known to be in press or under preparation.

It will thus be seen that Williston's "Synopsis," upon which all work has been previously based, is fast becoming insufficient, and a new monograph is desirable if confusion is not to result. So various are the media of publication that it is extremely difficult to follow fully the new descriptions, to keep up with the literature,

and properly to recognize species. With a view to aiding in the locating of literature, a complete bibliography has been prepared and will be published at a later date. This contains a large number of publications which are not of the same importance as those contained in the brief bibliography, which deals chiefly with those publications which are really essential in the taxonomic study of the family.

The author wishes to express his most sincere appreciation and thanks to all those who have assisted him in the preparation of this work by the generous loan of material and helpful suggestions. Especial thanks are due Dr. A. L. Melander, Dr. C. L. Metcalf, Dr. J. M. Aldrich, Mr. Raymond C. Shannon, Dr. A. J. Hunter, Mr. A. B. Champlain, Dr. J. McDunnough, Dr. C. F. Adams and others, who have loaned very valuable material, without which the present work must have been far from complete.

Much of the synonomy has been taken bodily from Doctor Aldrich's "Catalogue," the value of which is so well known.

## THE SYSTEMATIC POSITION OF THE SYRPHIDÆ.

Among entomologists in general the family Syrphidæ is considered among the lowest in the Cyclorrhapha. This is due to the fact that the Platypezidæ, Pipunculidæ and Syrphidæ lack or do not possess a true frontal lunule, and the ptilinum is not well developed in making their escape from the pupal case, and is probably only rudimentary, as a rule. On the other hand, it is generally conceded that the Syrphidæ bear no close relationship to any of the families of the Orthorrhapha.

A review of works dealing with the classification of the Diptera at once reveals the fact that authors have invariably based their conclusions upon what we are pleased to term evolutionary or acquired characters, and most of them were fain to argue that these characters were never lost. For example, we might consider the wing venation of the various dipterous families and follow the diminution of the number of veins from the Tipulidæ to the acalyptrate Muscidæ. The acquired character here is the fewer number of veins in what are undoubtedly among the higher families.

Shannon has pointed out that the relation of *Cerioides* (Syrphidæ) and certain Conopidæ (*Conops*) goes no further than a superficial resemblance, and in this I fully agree. He has also pointed out that the same relationship exists between *Microdon* (Syrphidæ) and *Stratiomyia* (Stratiomyidæ). While I concur to a certain ex-

tent in this latter view, I cannot help but consider the presence of spines on the scutellum, presence of a stump of vein into the first posterior cell of *Microdon*, general shape, and the confusing superficial resemblance, to be of much greater importance in tracing the relationship of the family than is obtained by the use of taxonomic characters generally employed for such purpose, especially if we adhere to the old interpretations of such.

We can only learn by experience, and I believe that experience has taught us that not only the generic limitations are faulty, but that we cannot rely upon family limitations in many cases, nor can we always agree upon the position of various groups or individuals. It is only recently, too, that the biological aspect has been considered of importance in determining relationships. In this, as in other things, we must not overestimate its importance, but must move carefully else we produce greater errors than has been the case in the past.

That we will one day arrive at a definite and stable classification may seem doubtful, and undoubtedly is. However, it must be confessed that if we would make any progress in this direction we must depart from the lines previously followed and find supplementary characters, which no matter how diverse, no matter how insignificant within a group, may by some happy chance aid in the solving of some of the perplexing questions of relationship. As an example of just such a character, I refer to the discovery by Shannon that the humeri of a large, ill-defined group of Syrphidæ lacked the usual pile, a happy example of the clearing up of one of the most perplexing questions facing us in the limitation of subfamilies. Again, the use of the presence or absence of a raised margin on the abdomen of several groups of Syrphinæ serves to establish much more clearly the limits of certain genera.

Should we continue to use the taxonomic characters discussed, in the same way as formerly, would we not be justified in assuming that the genus *Syrphus* is the most highly developed genus in the family? Undoubtedly it is entitled to such position if we give due prominence (in the old sense) to the wing venation, because it is here found to most closely approach the Muscoidea. I cannot consider this to be so, but believe that the strengthening of the veins, the curvature of the third longitudinal vein, together with the very large squamæ, broad front, etc., of the Eristalinæ indicates the latter to be the most highly specialized if we consider the Muscidæ to be higher in the scale than the Syrphidæ, and must confess that I would

find it difficult to alter this arrangement, with our present knowledge to go by, even though it were considered that the Syrphidæ were the more highly specialized.

I must admit that I have failed to find any connection between the Syrphidæ and any other family. My investigations, in so far as they have gone, lead me to believe that the Syrphidæ, Conopidæ, Muscoidea, etc., arose at about the same time from primitive ancestors, or ancestors which were more closely related to the Stratiomyidæ than to any of the families placed between the two groups. Such an origin is not only feasible, but is, I think, much more acceptable than the present classification. The pilose squamæ in *Syrphus,* possibly a recurrent character, apparently developed shortly after the Syrphidæ were established, less likely inherited directly from the ancestor, unless the family is derived from a closely related group of ancestors. The spines on the scutellum of *Microdon* point also in the same direction, as does the presence of the stigmatical cross vein, the spurious vein itself, and the stump of vein in *Microdon, Cerioides,* etc. Also, several meristic variations, which will be discussed at a later date, tend to confirm this view.

The absence of a frontal lunule is not, I think, an indication of lower origin, but rather an indication of progress in an entirely different direction. The indications are that the family was at first parasitic or predaceous upon plant lice and that their return to the herbivorous or scavenger habit was due to the fact that suitable animal food was not abundant enough at that period to support the hosts of syrphids, perhaps not numerous in species, but rich in numbers. The return to the herbivorous habit would naturally occur among those species which were least able to secure food, and their methods of battling for existence must have been varied, some adapting themselves gradually, others plunging wholly (in an evolutional sense) into different habits, which gradually developed, in those species which lived in more or less liquid media, robust, strong flying species, while those living in the presence of less succulent food, or less abundant, were more slender or flattened, yet not so pinched or thin as those which remained upon plant lice. Even today all these forms and variations may be found, with indications of intergradation, and even further specialization, occurring at the present time.

It is an accepted fact that the larval habit is secondary. At the same time there cannot be the least question about the larval associations and food habits having a gradual effect upon the ap-

pearance of the adult. One cannot produce a fat hog on sawdust, nor can a robust fly be produced upon aphids, nor, for that matter, can predators upon small insects develop to any great size, nor would they be fitted for parasitic life if such were the case. The Tachinidæ are undoubtedly an exception, but they prey upon large insects where plenty of food is available; even so, are we sure that the parasitic species may not be undergoing gradual change?

It is undoubtedly a fact that one can distinguish in the great majority of cases between a predaceous and herbivorous dipteron by the shape and robustness of the imago. We are told that it is possible to distinguish between a predaceous bug and an herbivorous one by the longer, more slender beak of the latter. In the same way the abdomen of many Diptera serves as an indicator, with, of course, the usual exception. In the Conopidæ the abdomen is either laterally compressed or sessile; in the Bombyliidæ and Asilidæ it is either flattened or narrowed; in the predaceous syrphids it is either very much flattened or very slender.

In this connection also I am firmly of the opinion that the number and curvature of the veins is of less importance than we have heretofore concluded, in deciding that a family is primitive, in accordance with the greater number of veins present. It appears that the number of veins and the strength of these is largely determined, not by the primitiveness of the insect, but to a certain extent by its habits. I do not mean that we must discard the use of venation in classification, but I do think that this character has been used to such an extent that its rational value has been lessened. It is only natural to conclude that predators will possess strong wing veins, while those forms which are not swift fliers, and whose mode of existence in the adult form does not require swift flight, will possess a smaller number of veins, or they will be weaker. Those forms of the Syrphidæ which may sometimes be predaceous, feeding upon small flies, have the greatest development of the wings and are not only rapid, but at the same time remarkably strong fliers; also their legs are fitted for a sudden spring into the air. It is true that the Syrphinæ are all excellent poisers, but at the same time there is a remarkable diminution in the abdominal contents. In this case it is purely specialization, as the adults must be able to poise in order to select or search out suitable aphid colonies for the purpose of depositing their eggs. The same applies to the Eristalinæ in large part, as these too poise and select suitable places for oviposition. Few of the higher Cyclorrhapha are as speedy in flight as the ma-

jority of the Syrphidæ, and many are more or less retiring, hence require less strongly developed venation.

Considering these facts, I believe we must alter our opinions somewhat concerning the true relationship of the Syrphidæ with other families, and must conclude that, rather than being an intermediate family between the two suborders, it is really a branch of about equal standing, with adaptations along slightly different lines (from the remaining families in the suborder) fitting the family much better for its mode of life and conquest of the eternal question of the survival of the fittest.

## CHARACTERS OF THE SYRPHIDÆ.

The characters are most outstanding and the family is more sharply defined and limited than any of the dipterous families. With the exception of the African and Asiatic genus *Graptomyza*, and a few species of *Chrysogaster*, which lack the spurious vein, they may be characterized as follows:

Small to rather large flies. Head hemispherical, often elongated or produced on the lower part; usually as broad as, or a little broader than, the thorax. Face usually moderately broad, bare, or clothed with dust or short pile; excavated in profile beneath the antennæ and projecting below, or with a distinct convexity near the middle, or sometimes wholly convex, not with longitudinal furrows or lateral ridges; usually convex transversely, often with a median ridge. Oral opening large; proboscis rarely much elongated. Front never excavated. Antennæ usually porrect and approximated at their base; three segmented, usually with a dorsal arista, sometimes with a terminal style. Eyes large, bare or pilose; in the male more often contiguous above. Ocelli always present. Thorax comparatively large and robust, moderately arched above. Squamæ small to moderately large. Abdomen composed of four to six visible dorsal segments; hypopygium usually not prominent. Legs usually of moderate strength; never long. Bristles rarely present on any part of the body; never on the head. Abdomen generally thinly pilose or bare, but sometimes clothed with thick pile. Wings comparatively large; third longitudinal vein never forked; marginal cell open or closed; the fourth vein terminates in the third at or before its tip; three posterior cells; basal cells large; anal cell always closed before the border of the wing; *between the third and fourth longitudinal veins* and nearly parallel with them, *a false or spurious vein* (*vena spuria* of European authors), nearly always present and characteristic of the family.

## CHARACTERS AVAILABLE FOR CLASSIFICATION.

The structural characters of Syrphidæ on all parts of the body are of the utmost importance in classification. Indeed, many forms are so diverse that it is safe to say that to the average student of entomology, whose acquaintance with the family is often limited to the common forms, many of the genera at first sight appear unrelated, and some might readily be overlooked as foreign to the family. Perhaps this may best be demonstrated by the fact that during the examination of several collections of considerable importance I have found Syrphidæ included among duplicate material of the families Stratiomyidæ, Muscidæ and Conopidæ, and also have found a specimen of *Cerioides* which for many years had been included among some Hymenoptera.

Chief in importance is the head, which, besides presenting various characteristic shapes, bears organs which display a diversity of forms. The wings probably rank next; the thorax, legs and abdomen also presenting characters which in certain genera assume the utmost importance.

The head, when viewed from in front, may be triangular, oval or round; the occiput may be swollen, flat or receding; the face may be carinate, subcarinate, concave, convex, tuberculate, receding or prominent below; it may be narrow or very broad, its sides parallel or diverging, sometimes converging slightly below. The antennal prominence (sometimes termed the frontal prominence) may be conical, rounded or flat, or even pedicellate, and the antennæ may be situated at any point from below the middle of the head to rather close to the vertex. The antennæ themselves present most valuable variations in shape, size, length, etc., and the third segment may bear a terminal style or dorsal arista, which may be basal, subbasal, median or apical. The arista may be bare, pubescent or plumose. The eyes vary greatly in shape and size and may be densely pilose or bare, even within the same genus. The position and arrangement of the ocelli proves rather important for specific separation. The posterior ocelli may be more remote from each other than from the anterior one, or the anterior may be more remote from the hind ones; there may also be a vertical raised portion, termed the "vertical bump," which may or may not connect with the occipital triangle. The face may have the facial pits extending up the sides of the face almost to the antennæ.

The thorax, previously to Shannon's revision of the family believed to offer few stable characters, now, because of the bareness or

pilosity of the humeri, assumes an unique place in the taxonomy of the family, the bare humeri limiting the subfamily Syrphinæ with more distinctness than is the case with any other subfamily. The color, arrangement and length of the pile is also of importance both specifically and generically. The presence of bristles is characteristic of a few genera.

The wings furnish a large number of taxonomic characters of extreme importance. The position of the anterior cross-vein, either near the base of the discal cell or near or beyond its middle, serves to divide the family into rather distinct sections, but this character is not considered infallible, and I have placed the genus *Ferdinandea* in the Chilosinæ, although the cross-vein is near the middle of the discal cell in the former, but other characters indicate a very close relationship with *Chilosia*. Failure in the past to recognize the fact that this character alone cannot be relied upon as indicating relationship has led to considerable confusion in the association of several genera, the result being a decidedly unnatural disposition of the genera. The third longitudinal vein may be straight, gently or moderately curved, or strongly looped into the first posterior cell, and may end in or before the tip of the wing. The first posterior cell may be acute or almost rectangular at its end, depending upon the shape and position of the apical cross-vein, or it may be longer in its middle if the apical cross-vein is recurrent beyond its middle. The presence or absence of the stigmatical cross-vein, which is present in a few genera, most of which I have placed at the beginning of the family, also seems valuable, but whether its development is sporadic or not can only be determined by the study of forms from a much wider range than North America.

The legs show remarkable variations and developments in all their parts, which are of both specific and generic value. Several genera have processes on the coxæ and trochanters, especially the hind ones; the femora may be slender or considerably enlarged, straight or arcuate; the tibiæ may be straight or arcuate; the hind legs alone may be specialized and strengthened, or the front and middle pairs may display valuable characters, or all the legs may be simple or somewhat thickened. In the genus *Platychirus* of authors the anterior tibiæ and tarsi of the males may be remarkably flattened and expanded. The genus is a weakly founded one, and I have placed it as a subgenus of *Melanostoma,* because the females of the two genera are inseparable except by a knowledge of the species in question.

The squamæ are, in my opinion, of considerable importance in tracing not only the relationship of the genera, but seem also to serve to some extent in tracing the origin and relationship of the family.

The scutellum furnishes few structural characters of importance, but the presence or absence of bristles and spines, its color, color of its pile, and its shape, are often characteristic. In several exotic species examined it seems to possess more valuable characters, and in the Microdontinæ the position of the spines, shape of the scutellum, etc., are among the chief characters employed in separating the species, especially into groups.

The shape of the abdomen is most variable. It may be short, very long and slender, convex, flattened, robust, spatulate, elliptical, etc. Its sides may be beaded, as pointed out by Shannon, as in the genus Chrysotoxum; or margined, a character well developed in some Syrphinæ. The employment of this latter character allows much more satisfactory conclusions to be arrived at than was previously the case with *Syrphus* and allied genera. The color, whether unicolorous, fasciate, spotted, etc., is also a valuable character.

## CLASSIFICATION.

In the present work the author has prepared a key to the genera which combines the artificial and synoptic types of keys. In preparing this key it has been attempted to arrange the genera in their proper relationship to each other, but it is entirely impossible to follow out the natural sequence of development, owing to the evident branchings at various places. However, it is believed that the present arrangement is more satisfactory than those hitherto proposed. I am indebted to Mr. R. C. Shannon for several suggestions, and while I have not followed his ideas in detail, they are largely followed in principle.

While I have placed the genus *Cerioides* at the beginning of the arrangement, I am not at all sure of the actual position, and its elimination here is a matter of convenience. Two characters in particular lead to the belief that the genus is not naturally far removed from *Microdon:* the presence of the stigmatical cross-vein in *Cerioides, sensu strictu,* and the stump of vein into the first posterior cell in many species. It appears also that these two genera are connected by the genus *Mixogaster,* but the genitalia of this latter genus is much more like that of *Microdon.* In this, as in all other cases, the material at hand is too limited to lead to any

definite conclusion, and the world fauna must be studied in detail before the true relationship is determined.

In *Microdon fulgens* Wied. appears to be what I have considered a connecting link with the subfamily Volucellinæ, as in the species mentioned the apical cross-vein is recurrent. This would seem to indicate that there is a close relationship between these two subfamilies, many species of which have parallel biological aspects, in that they live in the nests of bees and ants. Such a relationship would bring the Eumerinæ close to *Volucella* and *Paragus*, which seems to be a natural arrangement. The Nausigasterinæ must be allied to *Microdon*, because of the fused abdominal segments, but it is such an aberrant group that its relationship is very difficult to trace.

On the other hand, it appears that the Syrphinæ are allied to *Microdon* through *Paragus* and *Microdon scitulus* Will., but there is no true connection. Thus we have, according to this arrangement, most of the small subfamilies gathered together and eliminated at the beginning of our table, and this permits of the gradual development of the following subfamilies in what appears to be a gradual evolution. Mr. Shannon has suggested that the Syrphinæ and Chilosinæ have arisen from two distinct ancestors, and while this is possible, I am strongly inclined to believe that there must be some direct connection between the *Melanostomini* and *Chilosini*, as not only are the general facies similar, but the genitalia are also almost identical in general structure. The question is a debatable one and requires further study.

It is probable that the Chilosinæ should be limited to the genera *Pipiza, Pipizella, Cnemodon, Heryngia, Chilosia, Cartosyrphus, Ferdinandea* and *Chrysogaster*, and the remaining genera included under Xylotinæ. However, there is very little distinction which can be drawn between the two subfamilies, except that in the *Chilosini* Shannon the face is pilose in most of the genera, on the slopes, while the frontal triangle is also pilose to a greater extent than in any of the Xylotinæ or other genera of the Chilosinæ. *Criorhina nigripes* Williston has the lower part of the face pilose, a character not found in other Xylotinæ, but whether this may be used as a means of tracing the relationship of the following subfamilies is yet to be determined.

I have followed Shannon in the disposition of the genera *Merapioidus* (*Criorhini*), *Pyritis* (Sericomyinæ) and *Callicera* (Chilosinæ), but I am not at all sure that this is the correct disposition

of the genera. All present much the same superficial facies to large degree, and I am not certain that they should not be regarded as separate units. Certainly *Merapioidus* is related to *Criorhina*, but the pilose, broad face would seem to separate it considerably. It may be that the present placing is the correct one and that they are excellent examples of the proverbial exception.

The true relationship of the Sericomyinæ is problematical, and possibly an arrangement closer to *Volucella* would be more natural. *Milesia* undoubtedly belongs somewhere between the Xylotinæ and Eristalinæ, with indications of a closer relationship to the latter, but its position is also problematical.

The Eristalinæ are a compact group, readily distinguished by the dense hair at the bases of the femora.

Eumerinæ, subfamily, new, may be characterized by the pilose humeri, bare arista, large third antennal segment, strongly recurrent apical cross-vein, and stout legs, and usually more or less drooping abdomen, which usually is marked with tomentose greyish or silvery spots.

## SYNOPSIS OF THE GENERA.

### *a.* CERINÆ.

1. Antennæ with a terminal style; thorax usually with distinct yellow markings; pile short; wasplike flies ..... *Cerioides*
   Antennæ rarely with terminal style; if so, the thorax has not distinct yellow markings and any abdominal bands are interrupted (all other subfamilies) ..... 2

2. Arista bare; antennæ usually as long as the face, which is convex, pilose; third vein usually with a stump of vein extending into the first posterior cell; males dichoptic; four visible segments in male, five in female; anterior cross-vein before the middle of the discal cell; apical cross-vein often recurrent ..... 3
   Antennæ usually shorter; four to six visible abdominal segments; face concave, tuberculate or carinate (if the antennæ are elongate the humeri are bare; or the arista plumose; or the antennæ with a terminal style) ..... 5

### *b.* MICRODONTINÆ.

3. Third vein with a stump of vein extending into the first posterior cell .. 4
   Third vein without a stump of vein ..... *Mixogaster*
4. Abdomen spatulate ..... *Rhopalosyrphus*
   Abdomen not spatulate ..... *Microdon*

5. Humeri not pilose ..... 14
   Humeri pilose ..... 6
6. *All the femora with a patch of stubby black hair on their bases anteriorly; third vein strongly curved into the first posterior cell ..... 78
   Hind femora never with such a patch of hair; third vein only moderately curved ..... 7

* This patch of hair appears as a roughened area, and the individual hairs are seldom distinct.

7. Arista plumose ..... 8
Arista bare or pubescent, rarely very short plumose (if so, the legs with bristles) ..... 12
8. Apical cross-vein recurrent ..... 9
Apical cross-vein not recurrent, or at least the first posterior cell not longer in its middle ..... 11

*c.* VOLUCELLINÆ.

9. Arista very densely plumose, the plume appearing as a solid mass, *Copestylum*
Arista loosely plumose ..... 10
10. Hairs of the arista retrorse ..... *Megametopon*
Hairs of the arista not retrorse ..... *Volucella*

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11. Facial side margins extending almost to the base of the antennæ and very distinct ..... 35
Facial side margins not extending distinctly above the middle of the convexity ..... 74

*d.* EUMERINÆ.

12. Apical cross-vein strongly recurrent, the first posterior cell much longer in the middle ..... *Eumerus.*

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Apical cross-vein not strongly recurrent, the first posterior cell not longest at the middle ..... 13

*e.* NAUSIGASTERINÆ.

13. Anterior cross-vein before the middle of the discal cell; abdomen unusually strongly convex, entirely hiding the genitalia; abdomen densely punctate, with seemingly irregular pollinose greyish areas, *Nausigaster*
Abdomen not so convex and the genitalia not hidden when viewed laterally; abdomen not densely coarsely punctate and not with irregular pollinose areas; third antennal segment not appearing abnormally larger than the first two segments combined ..... 34

*f.* SYRPHINÆ.

14. Antennæ elongate, porrect; thorax and abdomen with bright yellow markings; apices of the abdominal segments "beaded" .. *Chrysotoxum*
Antennæ shorter; apices of the segments not "beaded" ..... 15
15. Face and scutellum usually more or less yellowish or translucent (if the face is entirely black the abdomen is not over twice as long as wide) ..... 16
Face wholly black, the scutellum rarely with a yellow tip .....*32
16. Small species, the abdomen usually more or less drooping; never in North American species with yellow fasciæ, but often largely reddish; second antennal segment over twice as long as broad; face rarely almost all black ..... *Paragus*
Abdomen not normally drooping; antennæ usually shorter; abdomen usually with yellowish spots or bands ..... 17
17. Abdomen margined (*i. e.*, the side margins raised and not curving under fig. 51, pl. VII) ..... 18
Abdomen not margined, the thin side margins curving under ..... 23
18. Long pilose species, the base of the abdomen largely pale yellowish; eyes pilose; abdomen moderately broad ..... *Leucozona*
Shorter pilose species ..... 19

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* *Paragus* and *Baccha* might rarely be carried past here.

19. Pleuræ with very bright, not diffuse yellow markings; sides of the thorax bright yellow; front long and narrow.....*Xanthogramma*

    Pleuræ with diffuse yellow markings or none; sides of thorax sometimes yellowish ..... 20

20. Cubital vein dipped into the first posterior cell; third antennal segment long and robust; front not puffed out in either sex; large, flat, fasciate species .....*Didea*

    Cubital vein rarely dipped (if so, the abdominal spots lunulate and the front more or less puffed out)..... 21

21. Male genitalia large and cylindrical; abdomen of female oval; fifth abdominal segment half as long as the fourth.....*Eupeodes*

    Male genitalie normal; if the fifth abdominal segment is almost half as long as the fourth, the abdomen is almost parallel sided and is at least not ovate..... 22

22. Front very much swollen; third longitudinal vein curved into the first posterior cell, so that the cell is much broader apically; wings almost without villi .....*Scæva*

    Front seldom much swollen; third longitudinal vein seldom as above; wings largely villous.....*Syrphus*

23. Pleuræ with bright yellow markings in addition to the yellow lateral margins; no yellow spots before the scutellum; dorsum of thorax not with a median cinereous stripe; abdomen elliptical, †*Xanthogramma*

    Not with all these characters..... 24

24. Eyes pilose; abdomen long and slender, the base with a pair of large, yellow, anteriorly contiguous spots.....*Ischyrosyrphus*

    Eyes bare or pilose; if pilose, without the large basal yellow spots..... 25

25. Pleuræ without distinct yellow markings, or they are diffuse if present; rarely a pair of small spots before the scutellum, in which case the abdomen is flattened, with parallel sides; never with a single median cinereous thoracic stripe.....*Stenosyrphus*

    Sides of the thorax yellow, or the abdomen very elongate and often spatulate ..... 26

26. Abdomen very elongate, its sides parallel, or club shaped or spatulate; face narrow below ..... 31

    Abdomen more robust, but still not stout, the sides often parallel and sometimes appearing club-shaped because the basal part folds under strongly in drying ..... 27

27. Hypopygium of the male not globosely enlarged; fifth abdominal segment in the female with four yellow spots, the inner ones usually placed longitudinally, the outer ones oblique (if apparently belonging to *Sphærophoria* the face has a broad median black stripe), *Allograpta*

    Male genitalia globosely swollen, or the fifth abdominal segment not so marked; abdomen variable ..... 28

28. Male genitalia globosely swollen; abdomen of female elongate and rather slender, with subparallel sides; dorsum of thorax without slender median stripe or a pair of spots before the scutellum, . *Sphærophoria*

    Male genitalia not globosely swollen; thorax with a slender median cinereous line or with a pair of spots before the scutellum..... 29

29. Hind tibiæ of the male arcuate; the female abdomen broad and tapering .....*Toxomerus*

    Hind tibiæ not arcuate; the female abdomen with subparallel sides.... 30

30. Small species; the thorax with a median cinereous longitudinal stripe, *Mesogramma*

    Large, wasplike species; a pair of small yellow spots before the scutellum .....*Doros*

† One species of doubtful position.

31. Third longitudinal vein deeply bent into the first posterior cell, *Salpingogaster*

Third longitudinal vein straight or only gently curved.....‡*Baccha*

32. Wings shorter than the abdomen; abdomen parallel sided or broadest apically .....*Pyrophæna*

Wings as long as the abdomen..... 33

33. Abdomen broad and flat; face narrow below, retreating; tip of scutellum yellow .....*Xanthandrus*

Abdomen more slender, usually somewhat tapering; face broader, sometimes parallel sided, and often retreating; scutellum never in part yellow ..... 33*a*

33*a*. Front tibiæ or tarsi, or both, of the male dilated.....*Platychirus*

Front tibiæ and tarsi of male simple.....*Melanostoma*

34. Anterior cross-vein before the middle of the discal cell, or the thorax with distinct bristles..... 35

Anterior cross-vein at or beyond the middle of the discal cell; thorax rarely with short spines ..... 56

*g*. CHILOSINÆ.

35. Eyes bare ..... 36

Eyes pilose ..... 37

36. Facial grooves extending almost to the antennæ; fourth vein joining the third well before the wing tip; thorax often with bristles; anterior cross-vein well before the middle of the discal cell; arista often plumose .....*Cartosyrphus*

Facial grooves less distinct, or the anterior cross-vein about the middle of the discal cell ..... 43

37. Face tuberculate in both sexes; facial grooves extending almost to the antennæ; antennal pits confluent; face rarely partly yellowish; apical cross-vein never recurrent; antennal arista dorsal.....*Chilosia*

Facial grooves less distinct and never extending clearly to opposite the antennæ; apical cross-vein sometimes recurrent..... 38

38. Anterior mouth edge projecting.....*Psilota*

Face tuberculate or receding..... 39

39. Antennæ with a terminal style.....*Callicera*

Antennæ with dorsal arista ..... 40

40. Face distinctly wider at the oral margin than at the antennæ.....*Pipiza*

Face not wider at the oral margin than at antennæ..... 41

41. Hind trochanters of male armed with long process or the middle tibiæ expanded anteriorly in the middle; middle tibiæ of female slightly broadened .....*Cnemodon*

Posterior trochanters without such process, the middle tibiæ slender, not convex anteriorly; eyes of female often with bare median vitta. 42

42. Fifth ventral segment only half as long as fifth dorsal in the male; antennæ of female elongate oval .....*Heryngia*

Fifth ventral segment at least three-fourths as long as fifth dorsal; antennæ of female more slender, over twice as long as wide, usually much longer; eyes often with a median transverse bare or less thickly pilose stripe .....*Pipizella*

43. Thorax with strong bristles, the legs without them; abdomen brassy or strongly metallic, with moderately abundant pile.....*Ferdinandea*

Abdomen rarely wholly or chiefly metallic, if so the scutellum without bristles ..... 44

‡ The genus *Ocyptamus* is inseparable from *Baccha*.

44. Antennæ elongate or the abdomen largely opaque black; short, compact species; always without yellow markings on the abdomen. *Chrysogaster*

Antennæ short; often more or less marked with yellow on the abdomen ..... 45

45. Abdomen constricted basally or the third antennal segment greatly enlarged ..... 46

Abdomen not constricted basally; third antennal segment not unusually large ..... 49

46. Antennæ with a terminal style..... *Pelecocera*

Antennæ with a terminal or dorsal arista..... 47

47. Abdomen not constricted basally..... *Chamæsyrphus*

Abdomen constricted basally ..... 48

48. Third antennal segment distinctly longer than broad; arista shorter than the antennæ ..... *Neoascia*

Third antennal segment more or less roundish; arista longer than the antennæ ..... *Sphegina*

49. Face wholly black in ground color..... 50

Face partly yellow or reddish in ground color..... 52

50. Pile of the thorax and abdomen scalelike..... *Lepidostola*

Pile not all scalelike; some of it erect..... 51

51. Scutellum large, subquadrate; males dichoptic..... § *Chalcomyia*

Scutellum rounded apically ..... *Myiolepta*

52. Body clothed with whitish or yellowish scalelike appressed pile. *Eumyiolepta*

Body with normal pile..... 53

53. Legs bearing distinct bristles..... *Hammerschmidtea*

Legs without bristles ..... 54

54. Epistoma produced into a long, porrect snout..... *Rhingia*

Epistoma not produced snoutlike..... 55

55. The costal vein ends at the tip of the wing..... *Brachyopa*

The costa ends before the tip of the wing. See..... *Cynorhina*

*h.* XYLOTINÆ.

56. Thorax with distinct yellow markings in addition to those on the humeri or rarely on the pleuræ ..... 67

Thorax not with distinct yellow markings, although in *Syritta* and *Pterallastes* the thorax is largely or all pollinose..... 57

57. Third longitudinal vein moderately curved into the first posterior cell.. 69

Third vein not or only slightly curved into the first posterior cell..... 58

58. Face produced downwards; often an indication of a tubercle..... 59

Face produced well forwards and somewhat downwards or evenly concave and not produced at all downwards..... 63

59. Pile long and furry, usually bumblebee-like in appearance..... 62

Pile shorter, flies not bumblebee-like in appearance..... 60

60. Antennæ inserted on a long conical prominence; face retreating below. *Somula*

Antennæ not inserted on a long prominence; inserted lower down on the head; shape of abdomen oval, subtriangular or tapering..... 61

61. Hind femora simple; abdomen elliptical or somewhat subtriangular. *Cynorhina*

§ The species *C. atra* n. sp. is doubtfully placed here, as the male is unknown and may be holoptic. The subgenus *Chalcosyrphus* is suggested for the species. See description.

Hind femora swollen and with an apical projection in the male and female; abdomen of the male tapering, rather slender.....*Cynorhinella*

62. Arista not placed at the tip of a conically produced third antennal segment .....*Criorhina*

Arista placed at the tip of a conically produced third antennal segment .....*Merapioidus*

63. Epistoma produced forwards and downwards.....*Criorprora*

Epistoma not produced downwards and not extending forwards beyond the antennal prominence ..... 64

64. Bumblebee-like flies, the pile very dense.....*Pocota*

Not bumblebee-like, the pile short or sparse..... 65

65. Head triangular; pile rather long.....*Brachypalpus*

Head broadly oval; pile short, the ground color very distinct..... 66

66. General color of the abdomen always brassy or strongly metallic, with more or less opaque black.....*Calliprobolla*

General color of the abdomen shining, but not wholly strongly metallic; abdomen more flattened; often more or less opaque.....*Xylota*

67. Face produced downwards, longer than the front.....*Sphecomyia*

Face not produced downwards, shorter than the front..... 68

68. Hind femora without a toothlike projection below near the distal end. *Temnostoma*

Hind femora with a sharp toothlike projection below near the outer end. *Spilomyia*

69. Hind femora with a bifid spur below; face concave, subcarinate, *Scnogaster*

Hind femora not with such bifid spur..... 70

70. Hind femora remarkably swollen, never with a triangular protuberance, though often modified with spines and teeth; head almost circular, the cheeks very narrow.....*Syritta*

Hind femora less swollen; head not globose..... 71

71. Hind femorâ with a small toothlike projection below towards the apical end ..... 77

Hind femora with or without a triangular projection near the apical end ..... 72

72. Hind femora with a triangular projection apically.....*Tropidea*

Hind femora not with a triangular projection..... 73

73. Hind femora arcuate; hind tibiæ with a median internal spur, *Teuchocnemis*

Hind femora less arcuate, their tibiæ not with an internal spur, *Pterallastes*

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*i.* SERICOMYINÆ.

74. Abdomen with light spots or bands..... 75

Abdomen without light markings..... 76

75. Postalar calli with short, stout bristles; abdomen with roundish spots; third longitudinal vein moderately curved into the first posterior cell .....*Condidea*

Postalar calli without bristles; abdomen with narrow bands beyond the second segment; third vein rarely gently curved.....*Sericomyia*

76. Face very broad and swollen; pile almost unicolorous.....*Pyritis*

Face not unusually broad; pile bicolored.....*Arctophila*

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*j.* MILESINÆ.

77. Elongate wasp-like flies.....*Milesia*

*k.* ERISTALINÆ.

78. Usually thinly pilose; if thickly pilose the arista somewhat plumose at least basally ..... 80

Usually thickly pilose; hind femora sometimes with a basal and apical swelling; bumblebee-like in appearance..... 79

79. Face concave in profile; arista shorter than the antennæ.....*Merodon*

Face tuberculate or somewhat swollen below the middle; arista longer than the antennæ.....*Mallota*

80. Large robust species, about 17 mm.; abdomen of male chiefly red; of female blackish, with greyish transverse spots or lunules; hind tibiæ arcuate .....*Polydontomyia*

Usually not over 14 mm.; not so marked..... 81

81. Posterior ocelli closer to the eyes than to each other; lying almost against the eyes; males dichoptic.....*Asemosyrphus*

Males holoptic or the thorax with yellowish or greyish vittæ..... 82

82. Thorax with yellowish or greyish vittæ; males dichoptic.....*Helophilus*

Thorax not with vith vittæ; males holoptic..... 83

83. With bright yellow tomentose markings on head, thorax and abdomen, the ground color not similar to the yellow markings.....*Meromacrus*

Yellow color of thorax and abdomen not due to tomentum, although sometimes partly so; face more or less tuberculate, not evenly concave; arista often more or less plumose.....**Eristalis*

## SUBFAMILY CERIOIDINÆ.

This subfamily is composed of the single genus *Cerioides,* and was established by Williston in 1886, as the subfamily Cerinæ, and in this he was followed by Verrall in 1901. Lundbeck, while using the name *Cerioides* for the genus, used the name Ceriinæ for the subfamily. Bezzi, in his "Syrphidæ of the Etheopian Region," 1915, used the name Cerioidinæ, and this must be regarded as the proper procedure if we are to recognize the generic name *Cerioides.*

### GENUS CERIOIDES Rondani.*

*Ceria* Fabr., Syst. Ent., 14, 277, 1774; Syst. Antl., 173, 1805. (Preoccupied.)

*Cerioides* Rondani, Ann. Soc. Ent. Fr., ser. 2, viii, 211, 212 (*Cerioides* and *Sphiximorpha*), 1850; Dipt. It. Prod., i, 55, 1856 (*Ceria* and *Sphixomorpha*); ii, 212, 214, 1857 (id.). Lundbeck, Diptera Danica, v. 589.

*Ceria* Williston, Syn. N. Am. Syrphidæ, 259, 1886. Verrall, Brit. Flies, viii, 664, 1901.

Characteristics: Antennæ with a terminal style; frequently situated upon a pedicel. Eyes of male holoptic. Face rather broad; descending perpendicularly, more receding below; not distinctly tuberculate. Front broad in the female. Vertex swollen. Thorax with yellow markings. Scutellum small. Squamæ narrow. Abdomen elongate, often pedicellate; seldom regular in outline; usually with yellow fasciæ and often with additional spots. Legs not much specialized, but the femora all stout. Wings darkened on the anterior half. Venation as in Fig. 1, Plate II.

Little is known about the biology. Imagines have been secured from larvæ

* It would appear that this is a complex genus, but in so far as our North American forms are concerned, it is deemed advisable to retain them in the single genus. If dealing with forms from south of the United States, several genera should be recognized and are well founded.

and pupæ taken from exuding sap of wounded trees and also from decaying wood. Their metamorphosis occupies a year.

The adults are found on bloom, but are not at all common. I have found them on New Jersey tea, Spireæ, and elder. The genus is a tropical one, but a few species occur as far north as Ontario and Quebec. It is recorded from all the continents, but apparently its stronghold is in America. The present paper deals with fourteen species, thirteen from north of Mexico.

I have reluctantly accepted the name *Cerioides* for this genus, and only do so in order to avoid confusion. Several European students have refused to change the name from *Ceria,* but the most recent publications dealing with the genus use the name which I have accepted. Apparently the name *Ceria* was first used by Scopoli in 1763 for a genus evidently identical with Geoffroy's *Scatopse,* 1764. It seems unlikely that a type species was designated for either of these genera at the time. In 1794 Fabricius established a genus *Ceria,* which is obviously the present one, but no species were mentioned as belonging to it. Rondani, in 1850, established the genera *Cerioides* and *Sphiximorpha,* the latter for the species with an antennal pedicel. Later, in 1857, he sank *Cerioides* under *Ceria* Fabr. Certainly the name *Ceria* has not been used for any other genus than the present one. I have not been able to secure Rondani's description of the genera in order to discover whether a type species was designated; if not, Williston's designation of *C. conopsoides* would be the first designation of a type species for the genus, and it seems that it would have been better had the arguments of Osten Sacken, Verrall and others been considered. It is regrettable that some entomologists must spend their time delving into old literature and raking up old and unused names, publishing these as the correct names for genera, while they do not consider in the least the complement of the old genera, nor the question of a type species. I do not believe that many of us are interested in catalogue names, nor do we care greatly what the name of a genus may be, although it seems that continuity in name is a rather desirable attainment in scientific nomenclature.

## SYNOPSIS OF THE SPECIES.

1. Antennal pedicel as long as the first antennal segment..... 2
   Antennal pedicel not more than three-fourths as long as the first antennal segment ..... 7
2. Thorax and abdomen reddish brown or reddish, with yellow markings .....*snowi* Adams
   General color black..... 3
3. Second, third and fourth segments with yellow spots in addition to the yellow band .....*pictula* Loew
   No yellow spots, although sometimes more or less pollinose..... 4
4. The black of the vertical triangle connects broadly with the black of the occiput; in the male the black of the front and upper portion of the face is bell-shaped.....*tridens* Loew
   The black of the vertical triangle is only narrowly connected with the black of the occiput at the vertex, usually by a slender rusty brown line or not at all; black of front of male not bell-shaped..... 5
5. Lower fourth of the front of the female yellow; yellow hind margin of the fourth abdominal segment twice as broad as that of the third segment .....*ancoralis* Coquillett
   Front with four yellow spots in female; yellow hind margin of fourth segment scarcely broader than that of the third..... 6

6. Third antennal segment of female more or less obscurely reddish basally; front of female with coarse shallow punctures on the depressed triangle; yellow spots above the antennæ oval or roundish; in the male no triangular projection of black between the stripe separating the face and front and the longitudinal frontal stripe.. *abbreviata* Loew

Third antennal segment of female wholly black; the front not so coarsely roughened; yellow spots of the front elongate, pointed; abdomen of both sexes a little more slender; male with a triangular black projection on the front between the stripe separating the face and front and the frontal longitudinal stripe..... *proxima* n. sp.

7. Second abdominal segment with an elongate triangular yellow spot reaching nearly to the apical yellow band; first and second segments fused; abdomen scarcely constricted..... *cylindrica* Curran

Second segment without triangular yellow spots, or the abdomen pedicellate ..... 8

8. Antennal pedicel longer than the width at its apex when viewed from above ..... *9

Antennal pedicel not longer than broad when viewed from above..... 11

9. Ground color of the thorax black..... 10

Ground color of the thorax reddish, with a black median stripe, - *abdominalis n. sp.*

10. Larger, about 16 mm.; second segment with a yellow spot on each side narrowly contiguous ..... *loewii Williston*

Smaller, not over 12 mm.; second segment reddish on the basal half, *townsendi* Snow

11. Antennal pedicel almost wanting; scutellum wholly yellow; antennal style not silvery..... 12

Antennal pedicel practically half or more as long as broad..... 13

12. Inner arms of the U on the third segment wholly obsolete, *ontariocnsis* Curran

Inner arms of the U on the third abdominal segment not more than one-third obsolete ..... † *signifera* Loew

13. Face black, the sides broadly, and the cheeks behind, yellowish, *pedicellata* Williston

Face with a broad brownish-reddish or reddish median stripe, a lateral reddish brown stripe and two black stripes on the cheeks.. *capitis* n. sp.

## 1. *Cerioides abdominalis* n. sp.

(Plates I and II.)

Length, about 20 mm.

*Male*. Face brownish red, on each side with a broad yellow stripe, which is slightly narrowed below and does not quite reach the antennal base above; on the upper fifth of the face a large orbital spot, yellow, connecting broadly with the yellow stripe at about its upper three-fourths. Frontal triangle yellow, with an obscure reddish stripe extending from the junction of the eyes to the reddish ground color about the base of the antennæ. Vertex reddish yellow; posterior orbits yellow pollinose. Cheeks with a blackish stripe extending from the eyes to the tip of the oral margin; oral margin very narrowly black; the black stripe of the cheeks rises immediately below the eyes and extends obliquely forward. Antennal pedicel reddish yellow, about three-fourths as long as the first antennal segment and broadest apically; antennæ

* I have not seen *C. loewii*, and the species may belong in the other section.

† *C. willistoni* Kuhl is a synonym.

reddish brown, the first two segments darker apically; third segment velvety; style slender, silvery.

Thorax brownish red, in the middle of the dorsum with a rather broad longitudinal brownish stripe reaching quite to the scutellum. Humeri, a spot on the outer ends of the suture and a slender sutural stripe, yellow; an obscure lighter stripe inside the humeri. Sternum black. Scutellum reddish, black beneath.

Legs yellowish red.

Wings brown anteriorly; hyaline posteriorly. Squamæ yellowish, with a fringe of short, yellow pile. Halteres reddish yellow.

First abdominal segment brownish red, its apex narrowly black; second segment much constricted, the greatest constriction just after its base, thence gradually widening to its apex, which is about two and one-half times wider than its least width; in color brownish, with a narrow yellow hind border and a pair of narrowly separated yellow basal spots, the lateral margins wholly more or less reddish. Third segment brownish, but the apical three-fourths densely subgolden yellow pollinose, obscuring the ground color, the hind margin broadly yellow; fourth segment wholly yellowish pollinose, the hind margin yellow. Hypopygium shining yellowish red, inclined to the left; peculiarly pointed.

Holotype, male; Santa Rita mountains, Arizona; July (F. H. Snow); in the University of Kansas Museum.

This species seems most nearly allied to *C. lowii* Williston, but is much larger, different in color, etc. It does not agree with any of the descriptions of American species. The single specimen was found among miscellaneous Hymenoptera in the museum collection, and is a very striking example.

## 2. *Cerioides capitis* n. sp.

(Plate I.)

Face and cheeks with four yellow longitudinal stripes on each side, in addition to a dirty yellow median line; antennal pedicel, when viewed laterally, directed strongly upwards; scutellum wholly yellow; abdomen pedicellate.

Length, 11 to 12 mm.

*Male.* Cheeks shining black; the jowls and a continuous area along the occiput chiefly reddish yellow, but somewhat irregularly faintly fuscous. An oblique stripe extends from the eye to the oral angles; a second stripe extends from the oral angles to about the middle of the orbital border of the face, and a third stripe rising below and a little to the side of the antennal pedicel, the upper end curving outwards, the lower end touching the sides of the anterior mouth edge, yellow. On the cheeks the yellow stripes are separated by a shining black stripe and a similar colored stripe separates the cheeks from the face. The stripes separating the facial yellow stripes are brownish luteous and extend around to form an arch above the antennæ and also connect with the median broad facial stripe, which is of the same color, but may be more or less bordered with black and may inclose a slender, incomplete median stripe of a black or brown color. The color of the broad facial stripe may be more yellow medianly, especially below. The yellow facial stripes on each side and the upper one on the cheeks coalesce near the oral margin and the outer facial stripe is narrowly connected to a tapering spot extending upwards along the

eyes, but separated from the yellow which occupies the upper border of the front by a narrow brown streak. Eyes touching for a distance equal to the length of the ocellar triangle. Vertical triangle short, yellow before the ocelli, elsewhere black. Vertex, extending well over behind the eyes, bright yellow. Occiput black, with silvery yellow pollen, and fine, sparse, white pile. Antennal pedicel luteous or dirty yellow, about one-third as long as the first antennal segment, directed strongly upwards. First segment long, reddish brownish yellow, with short black appressed hairs; second and third segments black, the second almost as long as the first, the third two-thirds the length of the second, tapering almost from the base; style short, robust, almost equal in thickness throughout, the end rounded.

Thorax: dorsum and pectus dull black, the pubescence very short and yellowish. Pleuræ largely and the posterior lateral margin of the dorsum piceous reddish. Humeri, a swollen spot laterally before the suture, two stripes on the pleuræ and one below the outer angle of the scutellum, yellow. A stripe extending from the postalar calli to the suture and ending just inside the yellow spot, yellowish red. Scutellum yellow, its margin dirty yellow.

Legs reddish, bases of the tibiæ broadly whitish yellow; tarsi also somewhat paler; an incomplete, broad, subbasal band on the under side of the hind femora.

Wings brownish luteous before the spurious and third longitudinal veins; the base of the wings as far back as the sixth vein, extending along the fifth vein, luteous yellow. Third vein slightly curved into the first posterior cell, the stump of vein long.

Abdomen rather dull black; sides of the first segment broadly, the broad hind margin and two small, subbasal narrowly separated spots, reddish. Narrow base of the second segment and large lateral spots on its basal third yellowish, the lateral margins reddish, the end with a moderately broad reddish yellow fascia. Third segment with the lateral and posterior margins reddish; fourth segment with these margins less clearly reddish. On the third segment there is a greyish golden, transverse, incomplete subapical pollinose fascia, the lateral ends narrow and more widely separated from the reddish apex than is the middle, the pollen extending forward medianly, but interrupted by a longitudinal black stripe (it is possible that this pollen may sometimes be almost lacking); on the corresponding area of the fourth segment the pollen is much more dense than on the third, and in addition, before the distinct fascia the surface is wholly thinly pollinose. Second abdominal segment strongly constricted, the greatest constriction at the basal third of the segment, thence gradually widened until the greatest width is reached at the tip of the third segment. (There is probably some variation in the color of the second segment, as well as in the apices of the segments.)

*Female*. Face similar. Front moderately broad; the sides below, extending more narrowly across the front a little above the antennæ, but widely separated in the middle, yellow. The general color of the front is rusty brownish. The vertex is orange yellow.

Abdomen not quite so much constricted; lateral margins brownish red; fifth segment similar in color to the margins. The third segment has only a trace of pollen, while on the fourth it forms narrow lunules similar in shape to those in the male, but there is scarcely a trace of pollen elsewhere on the segment.

Holotype, male; Mexico City, Mexico (Juan Muller). Allotype, female; District Federal, Mexico; July and August, 1910 (no collector's label). Types in the United States National Museum.

This species is close to *C. scutellatus* Williston, but differs in having no yellow spot before the scutellum, there are two vertical stripes on the pleuræ, the fourth segment has an apical reddish or yellow margin; the face and front are somewhat differently marked.

### 3. *Cerioides loewii* Williston.

*Ceria loewii* Williston, Synopsis, p. 260.

"Length, 16 mm.

"*Male*. Face sulphur yellow; from the antennal protuberance a moderately broad ferruginous stripe, white dusted along the middle, where it is the broadest, runs to the oral margin. Cheeks broadly dark ferruginous. From the base of the antennal prominence a small, indistinct projection on each side is directed outwards and downwards. Antennal process short, but little more than one-half as long as the first joint of the antennæ; the latter slender, about three-fourths as long as the two following together; second joint a little shorter than the third, style slender; the color is dark ferruginous. Vertex reddish yellow. Dorsum of thorax brownish black; red on the sides and on the meso- and ptero-pleuræ; humeri and scutellum yellow. Abdomen: First segment reddish brown; second segment rather slender, somewhat longer than the third, with a spot on each side, nearly contiguous, and narrow posterior margin, yellow, elsewhere reddish brownish black; third and fourth with broader yellow hind margins. Legs reddish yellow. Wings brown on the anterior portion; third longitudinal vein slightly angulated and with a stump of vein; first posterior cell closed in the border of the wing."

"Two specimens; Arizona (H. K. Morrison)" (Williston.)

I have not seen this species. It seems allied to *C. abdominalis*.

### 4. *Cerioides townsendi* Snow.

(Plates I and IX.)

*Ceria townsendi* Snow, Kans. Univ. Quart., iii, 246.

Length, 8 to 9 mm.

*Male*. Face yellow, with a median black stripe which is a little widened in the middle and narrowed below, extending from the antennal pedicel to the oral margin; in its middle usually with a narrow reddish or yellowish stripe. Face separated from the frontal triangle by a black horizontal stripe which is narrowed laterally; sometimes there is a second stripe extending obliquely onto the face, its point towards the eyes, but this may be wanting and there may or may not be indications of a brownish stripe between the black median stripe and the eyes. Opposite the antennæ the frontal triangle is rather broadly yellow, but only narrowly so above, and the yellow may be interrupted at the junction of the eyes or narrowly entire; frontal triangle elsewhere shining black or brownish. Vertical triangle reddish brown; vertex, extending along the eyes, yellow. Cheeks brownish rather rusty yellow; near the anterior margin of the brown with a more or less distinct yellow or reddish stripe, more pointed below, running from the eye to the oral margin. Antennal pedicel yellow, situated on a black ground, a little longer than broad and little more than half the length of the first antennal segment; first antennal segment reddish yellow, becoming piceous or darker apically; second segment not quite as long as the first, shining brownish, but there may be a

reddish tinge basally; third segment about one and one-fourth times longer than its basal width, dull brownish red, its apical end brownish; style short, brownish or reddish.

Thorax shining black, the dorsum less shining; pleuræ inclined to be brownish above, sometimes considerably so. Humeri, a spot on the outer end of the suture, the mesopleura, a spot below it and a spot below the squamæ, the scutellum except the black or brown base, reddish yellow; usually a reddish vittula extends forwards from the postalar callosity almost to the suture.

Legs shining ferruginous, bases of the tibiæ yellowish; hind femora moderately thickened and with short spines beneath; hind tibiæ arcuate, more strongly curved apically.

Wings hyaline behind the third longitudinal vein, brownish or yellowish brown anteriorly; the brown color does not reach the spurious vein at any point, but may extend slightly past the third longitudinal. Squamæ whitish. Halteres yellowish.

Abdomen variable. First two abdominal segments always brownish red, the second with the posterior border yellow; immediately in front of the yellow fascia the ground color is usually more blackish. Third and fourth segments varying from blackish to piceous brown or even brownish reddish, the posterior borders yellow or reddish; if the color is brownish red there is usually a darker area in front of the yellowish fasciæ; the yellow of the hind borders does not reach, or only indistinctly reaches, the lateral margin. Second segment rather much constricted, its greatest constriction just after the base; thence it gradually widens to the apex. The greatest width of the abdomen is at the apex of the third segment. Female similar.

Redescribed from the type and ten additional specimens.

### 5. *Cerioides pedicellata* Williston.

(Plate II.)

*Ceria pedicellata* Williston, Synopsis, 264; Biol. Dipt., iii, 77.

Length, 15 mm.

*Female.* Face black in ground color; on each side with an oblique yellow stripe, broad above and gradually narrowing to just laterad of the anterior oral margin, which it does not quite reach; immediately above, and confluent with this stripe, a small, roundish orbital yellow spot; opposite the antennæ a horizontally placed oval yellow spot, which emits a rather stout branch up along the eye margins to about half the distance to the vertex, which is also yellow. Cheeks reddish posteriorly. Antennal pedicel about as long as broad when viewed from the side, shorter than broad when viewed from above. First antennal segment long, slender, reddish yellow, becoming brownish apically; second segment not quite as long as the first, brownish red or brownish; third segment brown, not half as long as the second. Style yellowish, silvery in some reflections. Middle of the face and back of the cheeks silvery pubescent. Pile of the head fine, sparse, whitish.

Thorax black; the humeri, a spot at the outer end of the suture and a slender sutural stripe, yellow; postalar calli and the pleural sutures obscurely reddish; pleuræ more or less whitish pollinose. Scutellum yellow, with a rather broad depressed brownish band extending across its middle from the lateral angles. Pile short, yellowish.

Legs yellowish red, the anterior tarsi a little darker.

Wings dark brown in front of the spurious vein, hyaline posteriorly. Squamæ yellow, with yellowish fringe. Halteres yellow.

First abdominal segment shining black, its base and apex narrowly obscurely reddish. Second segment strongly constricted, cylindrical, about twice as long as the first segment, its apex of about the same width; on the sides basally with a more or less distinct yellow spot, the spots rather narrowly separated in the middle; these spots sometimes very distinct and extending in a more reddish color to the apical third; apical margin yellow; segment elsewhere black. Third segment strongly convex anteriorly, brownish black, a little shining, with an obscure greyish arcuate band on each side in the middle; apex of the segment reddish. Fourth segment similar in markings, but the arcuate bands more distinct and their inner ends stretching forward almost to the anterior margin; ground color scarcely shining, obscured by dirty yellowish pollen; on the fourth segment, extending onto the fifth, a median longitudinal more blackish stripe; fifth segment without reddish posterior border. Pile of the abdomen conspicuous basally, where it is long, whitish; it is also whitish on the lateral margins, but on the disc of the last three segments it is somewhat golden.

Four specimens from Texas. Originally described from Mexico.

## 6. *Cerioides signifera* Loew.

(Plate I.)

*Ceria signifera* Loew, Neue Beitr., i, 18. Giglio-Tos, Ditt. del Mess., i, 32. Johnson, Ent. News, iv, 91. Williston, Synopsis, 262.

*Ceria willistonii* Kahl, Kans. Univ. Quart., vi, 141. Banks, Proc. Ent. Soc. Wash., v, 310.

Abdomen pedicellate or strongly constricted; third and fourth abdominal segments each with a pair of yellow pollinose U's; hind trochanters of the male with a small spur; scarcely any antennal pedicel.

Length, 11.5 to 12.5 mm.

*Male.* Face black; beneath the antennæ a pair of narrowly separated suboval spots which are usually broadly connected with a lateral, slightly oblique stripe extending from the orbital margins to the side of the anterior oral margin, but not quite reaching it, the stripes tapering to a point, their upper ends broad and rather broadly touching the eye, and a streak on the hollow of the cheeks, yellow; a stripe on the upper half or more of the median black area, luteous or reddish. Frontal triangle black; a subroundish spot opposite the antennæ and a pair of narrow, orbital spots above, often contiguous, yellow. Vertical triangle small, black, the swollen vertex yellow, more reddish behind the eyes. Occiput black, silvery pollinose along the eyes. Pile whitish, short on the vertical triangle, on the occiput becoming longer below; elsewhere wanting. Antennal pedicel luteous; very short; antennæ dull black, the first segment reddish yellow or luteous on the basal half, but the color diffuses. First segment elongate, second about half as long, the third almost as long as the first. Style black, short, subpointed.

Thorax black, the dorsum finely scrobiculate, with short whitish pile. Humeri, a spot on the outer end of the suture, the mesopleuræ, a transverse spot below, the scutellum except the base and sides, yellow; a slightly curved vittula extending from the postalar calli to the suture, reddish; a triangular pollinose grayish yellow spot at the inner end of the dorsal suture.

Legs blackish brown; trochanters and bases of the femora and their apices, broad bases of the tibiæ, and the first two or three segments of the front four tarsi, luteous or yellowish. Hind trochanters with a short, sharp spur. Anterior four tibiæ more brownish red in color.

Wings brown before the spurious vein to the anterior cross-vein, beyond which the brown is limited by the third longitudinal vein; hyaline behind, but luteous along the sixth longitudinal vein. Squamæ whitish with pallidly yellowish fringe. Halteres yellow, the ends slightly reddish.

Abdomen slightly shining black, finely scrobiculate, the second segment more shining. Hind margins of the second, third and fourth segments yellow or reddish, the last band not reaching the lateral margins; on the base of the second segment a moderately narrow reddish or luteous spot on each side, separated by about the length of one spot, which is elongate as it follows the curve of the base of the segment, which is longer laterally; on the third and fourth segments on each side a yellow pollinose U, the first pair more shallow. Abdomen pedicellate, but the second segment rather stout, about two and one-half times longer than its least width; second segment elongate, third shorter, the fourth perhaps slightly longer than the first. Pile short, white, appressed except basally.

*Female.* The yellow facial stripes may reach to the oral margin, in which case the narrow anterior oral margin is also yellow. Front black, with a shallow depression surrounding the antennal pedicel; above this a pair of transverse reddish spots, narrowly separated and a little arched, corresponding to the yellow at the upper border of the frontal triangle in the male. Vertex reddish or orange colored; with the ocellar triangle swollen.

Legs somewhat lighter colored, usually piceous brownish, the hind trochanters without a spur.

Abdomen more robust, the second segment shorter than the third, and when viewed from above about twice as wide apically as basally. The U on the third segment is a little longer, those on the fourth shorter than in the male. There may be a pair of median transverse, obscure pollinose spots on the second segment. Fifth segment wholly black, with black pile apically.

Six specimens from Kansas, Missouri and Pennsylvania. One of the specimens was probably used by Kahl in drawing up his description of *C. willistonii*, but it bears no type label. The species has also been reported from Florida, Texas and Virginia.

I can see no reason why *C. willistoni* should be considered distinct. Kahl described *C. willistoni* from Kansas, basing his conclusions entirely upon Loew's description and the variation of his specimens from it. Possibly he was influenced by Williston's statement that his specimens did not agree fully with Loew's description. At most the differences are trivial and I can find nothing which bears out the conclusions arrived at by Kahl. The species is somewhat variable in markings, and it was upon color variations that *C. willistoni* was founded. Many Mexican species are also common to this country, and it is possible that most of those described from the former place will be found along our southern boundaries, but it is not unusual for Mexican species to occur as far north as Pennsylvania.

## 7. *Cerioides ontarioensis* Curran.

(Plate 1.)

*Ceria ontarioensis* Curran, Can. Ent., liii, 174.

Very much like *C. abbreviata* superficially but without the antennal pedicel and with U's on the third and fourth abdominal segment; differs from the preceding species in that the inner arms of the first pair of U's are entirely obsolete, it is more slender, etc.

Length, about 10.5 mm.

*Female.* Face black, with a broad, obtusely conical spot on each side immediately below the antennæ, connecting broadly on the side with an elongate spot at the orbits, which runs downwards towards the oral margin about four-fifths the distance, the stripes converging below; above these side stripes a small round orbital spot opposite the antennæ, an obscure median facial stripe and an obscure arcuate spot on the cheeks, its rounded side towards the anterior oral margin, yellow. Face perpendicular in profile, a little convex above the oral margin. Front black, with an interrupted, abbreviated, yellow arcuate spot above the antennæ in a reddish brown field. Vertex reddish. Occiput black, with yellowish pollen bordering the eyes. Pile short, sparse, pale whitish, confined to the cheeks and posterior orbits. Antennæ black, the first segment luteous on the basal half. Antennal pedicel oval, from front view, very short, luteous about the antennal base.

Thorax dull black, finely scrobiculate, with inconspicuous short black hairs; the humeri, a cordate spot before the outer ends of the suture, a vittula running from the postalar calli to the suture and curving inwards about the middle, a small spot inside its anterior end, an elongate spot on the mesopleura and a small roundish one below, yellow; pleuræ shining, scutellum yellow, its base and sides black.

Abdomen shining black, with short, inconspicuous black pile, the fourth segment with yellow pile and longer yellowish pile on the sides of the basal two segments. Second segment with a rounded, subcarinate swollen area at the base above; much narrowed basally; on each side with an elongate basal spot. Second to fourth segments with the apices yellow, the anterior yellow band broadest, that on the fourth segment narrowest; in addition, on each side of the third and fourth segments a yellow U, the convexity behind, those on the third segment with the inner arm obsolete.

Legs black; trochanters and base of femora, apices of the femora, broad bases of the tibiæ and their apices, and the first two or three segments of the front four tarsi, yellow or luteous; femora with double rows of small spines on apical half or fourth.

Wings hyaline, brown in front, more yellowish basally; third vein with a long stump of vein into the first posterior cell about its middle; the brown color extends slightly farther into the first posterior cell beyond the stump of vein, while in the basal half of the cell it just passes the vein.

Only the type specimen is known; Orillia, Ontario; May 30, 1920, (Curran).

This species is very closely allied to *C. signifera,* but is distinguished by its more slender form, roughened frontal triangles (in *signifera* the depressed triangles are almost smooth), shorter yellow spots above the antennæ, less ex-

tensively reddish vertex, and especially by its shining third abdominal segment. In *signifera* this segment is only very narrowly shining just at the base, and is elsewhere scrobiculate, and consequently not shining. There are very many other minor differences. The type specimen was taken on bloom of *Cratægus*.

### 8. *Cerioides cylindrica* Curran.

*Ceria cylindrica* Curran, Can. Ent. liii, 175.

"Eyes over twice as high as wide; abdomen black, with broad yellow segmental apices and elongate yellow triangular spots on each side of the second abdominal segment, reaching almost to the yellow apex.

"Length, 15 mm.

"*Male*. Face and front yellow, the former separated from the latter by a slightly darker curved line reaching from the antennal base to the eyes. Face with a median brown stripe enclosing a narrow yellow line; antennal process brown; cheeks shining black, narrowly connected along the oral margin with the median brown facial stripe. Face in profile conically produced downwards, very gently convex; the apex of the oral margin is almost as far below the lower border of the eyes as the antennal process is above. Antennal peduncle broadest at the apex when viewed from above, with a shallow longitudinal median line and a subapical depression or groove; not as long as broad; when viewed from the side it is slightly longer than broad, being compressed, so that it is about one-third as thick from the lateral view as from the dorsal. Antennæ opaque brown, third segment apaque black, style yellow, with silvery pubescence; first segment obscurely luteous basally, longer than the second, third segment slightly shorter than the second. Vertical triangle yellow, the ocellar triangle black; posterior orbits with yellow pollen along the eyes, the occiput black. Pile only on cheeks and occiput, sparse, yellow, shorter above.

"Thorax finally scrobiculate, with extremely short black pile, the color slightly shining black. The humeri, a spot at each outer end of the suture a small, indistinct spot at each side of the middle of the suture; a vittula running from the postalar calli almost to the suture, the mesopleuræ and a spot below, yellow; postalar calli reddish, with yellow pile; pleuræ with inconspicuous yellow pile. Scutellum yellow with a complete border of black, slightly over twice as wide as long.

"Legs reddish yellow, the last two or three tarsal segments brownish; apical half of the hind femora and a broad, preapical band on the hind tibiæ brownish. Wings pale brownish anteriorly, hyaline posteriorly.

"Abdomen slightly shining black, finely scrobiculate; first and second segments fused (?), with short black pile on the disc and yellowish pile on the sides; on the sides with an elongate yellow triangle reaching almost to the yellow hind margin, the inner points of the triangle well separated. Apices of the two following segments increasingly broadly yellow, the yellow on the fourth segment occupying nearly one-third of the segment, its anterior margin being convex on each side of the median notch; pile yellow; on each side of the third and fourth segment a moderately prominent grey pollinose stripe reaching from near the median anterior portion of the segment to a point about one-third from the apex and one-fourth from the lateral margins. Hypopygium black, with black pile. In outline the abdomen is slightly narrowed to the apex of the first segment, thence gradually widened to the apex of the fourth, where it is of about the same width as at the base. The fifth segment and hypopygium are almost concealed by the fourth segment."

"Holotype, male; Fallen Leaf, L. Tahoe, Cal.; July 15, 1915." (E. C. Van Dyke.)

I have not seen this species since it was described. My statements that the first and second segments are fused and that the "fifth" segment is almost concealed by the fourth, are most interesting if true, and while I believe that the former is accurate, the latter may be an error. If not an interesting con-

nection with the Syrphinæ is furnished. The outline of this species is very regular, and as I remember it not drawn in at the incissures as is the case in *C. tridens*, etc.

### 9. *Cerioides snowii* Adams.

*Sphyximorpha snowi* Adams, Kans. Univ. Sci. Bull., ii, 447.

Light brownish yellow, except a blackish or brown arch on the second abdominal segment.

Length, 10 to 11 mm.

*Female*. Face moderately shining creamy yellow, in the middle with a narrow ferruginous yellow stripe from the antennal base to the anterior oral margin and extending very narrowly along the oral margin to join an area of the same color on the cheeks. A slightly sinuate depression separates the face and front. The front is yellow on the lower half, ferruginous reddish on the upper part; the vertex, extending along the occiput above the eyes, yellow. In front of the ocelli, leaving a short, longitudinal median convex area, is a distinct depression on each side, commencing at the eyes and extending inwardly and forward, but not encroaching upon the yellow ground color. Front with fine, sparse, whitish pile; cheeks and posterior orbits with longer similarly colored pile; posterior orbital borders, silvery pollinose. Antennal pedicel reddish, as long as the two first antennal segments together; first and second segments of nearly equal length, the third slightly longer than the second; first and second segments reddish, a little brownish above; third segment reddish brown, velvety, reddish at the base below, in some reflections appearing silvery pubescent; style short, brown, pointed. In one specimen there are slight indications of the connection medianly of the ferruginous color of the upper part of the front with the base of the antennal pedicel.

Thorax ferruginous, somewhat shining. Humeri, lateral sutural spot, a broad vittula running forward from the postalar callus and the meso- and sterno-pleuræ in front, yellow; on the suture, visible in some lights, a grey pollinose stripe on each side, curved forward at the inner end; similar colored stripes on the anterior fourth of the dorsum a little over midway between the humeri and the median line. Scutellum yellow, its base concolorous with the dorsum of the thorax.

Legs reddish; tibiæ yellow basally, the last tarsal segment a little lighter in color.

Wings hyaline, brownish in front of the third longitudinal vein, but the brown color extends to the spurious vein on the basal three-fifths of the wing, and from thence extends only slightly behind the third longitudinal vein. Costal cell and base of the wing more luteous colored; there may be clear areas in the marginal and submarginal cells. Squamæ white with a yellowish fringe. Halteres yellow or reddish, the knob somewhat darker.

Anterior margin of the first abdominal segment very convex, especially laterally, the sides of the segment very broadly yellow, the anterior margin narrowly rusty reddish; in the middle shining brownish, but this color sometimes interrupted medianly by a ferruginous expansion from the anterior border. Second segment rusty red, the hind margin broadly, expanding somewhat laterally, yellow. Third segment similarly marked, but there is a broad lunulate lightly pollinose area of paler color occupying most of the reddish ground, the pale color commencing inside the anterior angles, concave in front, not reach-

ing the middle of the segment. A similarly colored and shaped area is present on the fourth segment, the ground color of which is about half yellow, half rusty yellowish. Fifth segment wholly reddish. The second to fifth segments each have a raised median longitudinal area which separates the pollinose bands. Pile of the abdomen subappressed, pale yellowish, longer, erect on the sides basally. There may be indications of the lunulate pollinose areas on the second segment. There are also indications of darker areas on the second segment just before the yellow band, at the base of the two following segments and on the median raised areas. Second segment not narrowed, only slightly broader apically, its lateral margin a little convex.

Redescribed from the two type specimens in the University of Kansas museum.

Notwithstanding the very different color, this species is remarkably similar in structure to *C. abbreviata*, the female of which also possesses the raised areas on the abdomen and a very similar basal differentiation of the first abdominal segment. The most conspicuous structural difference is found in the comparative length of the second and third abdominal segments, the second and third being of practically equal length in *snowii*.

## 10. *Cerioides tridens* Loew.

(Plates I and II.)

*Ceria tridens* Loew, Cent. x, 57. Williston, Synopsis, 263. Johnson, Ent. News, iv, 91. Townsend, Trans. Am. Ent. Soc., xxii, 54.

Antennal pedicel longer than the first antennal segment, luteous with the end blackish; the band on the fourth abdominal segment occupies about half the length of the segment in the middle.

Length, 11 to 12 mm.

*Male*. Face yellow; cheeks, a median stripe broadest on the lower third, a bell-shaped spot surrounding the antennal pedicel, dividing the yellow of the upper part of the frontal triangle and extending moderately onto the face, and the narrow sutures dividing the front and face, shining black. In profile the face is almost perpendicular, with a distinct swelling above the anterior mouth edge; wholly without pile or pollen, the frontal triangle with short, fine, white hairs. Vertical triangle black, on each side of the vertex an elongate yellow spot extending along the occiput behind the eyes. Occiput with yellowish grey pollen; together with the vertical triangle and cheeks, with short, whitish pile. Antennal pedicel over half the length of the antennæ, sometimes all luteous; at other times the apical half or more fuscous or blackish. Antennæ brownish black, the third segment with a slight velvety brown tinge, the two basal segments about equal in length, the third shorter than the second, its style short and sharply pointed.

Thorax black, the dorsum scrobiculate; humeri, a swollen subtriangular spot before the outer ends of the suture, an intra-alar dash, the pleuræ in the middle, and the scutellum, yellow. Postalar calli somewhat piceous or reddish.

Femora piceous black; the bases and apices of the anterior four, reddish yellow; hind femora yellow except the apical third or less, the tip also yellow; all the tibiæ yellow, with more or less blackish or brownish subapical bands, sometimes occupying over one-fourth the tibiæ; tarsi reddish; the median segments and all but the base of the hind tarsi, brownish.

Wings yellowish basally, luteous brownish in front, darker towards the end; luteous along the fifth vein; elsewhere practically hyaline. The curvature into the first posterior cell begins just after the anterior cross-vein, is deep, and may or may not emit a short stump of vein. Squamæ yellowish, the fringe yellow. Halteres reddish yellow.

Abdomen black, finely scrobiculate. Sides of the first segment, anteriorly more broadly, the hind margins of the second and third segments, more broadly laterally, and almost the apical half of the fourth segment in the middle, strongly attenuated laterally, yellow; the yellow of the fourth segment sometimes with an obscure oval black spot on each side of the middle. In addition, on the fourth segment there is usually a greyish pollinose lunule on each side, their inner ends narrowly separated, their posterior margin following the anterior border of the yellow. The basal swelling of the first segment is large, the apex medianly transversely prominent because of the curved basal depression. There are broad, longitudinal depressions on each side of the slightly raised middle of the third segment, while these depressions are most marked on the fourth and are covered with gray pollen, the middle line on this segment being markedly prominent. On the black of the second and third segment there may be some thin pollinose patches of a yellow or golden color, but they do not appear at all conspicuous.

*Female.* The yellow may extend completely across the front just above the antennæ. Legs yellow, the front femora with a dorsal black streak; tarsi more ochreous.

The description of the male is drawn from five specimens from California, May to July; that of the female is adapted from Williston. There is some variation, and the vittula above the wings may sometimes be absent. The species has been reported from Oregon (Lovett), Washington (Will.), Colorado (Johnson), New Mexico (Townsend).

In his description of the species, Williston probably had *C. ancoralis* before him as well as *tridens*, and a specimen in the University of Kansas museum labeled *tridens* in Williston's writing is *ancoralis*. It is possible that the records from New Mexico and Colorado also refer to *C. ancoralis* Coq. The depressions and yellow marking of the fourth abdominal segment and the decided interruption of the yellow of the vertex will distinguish this species from allied species.

## 11. *Cerioides ancoralis* Coquillett.

(Plates I and II.)

*Sphiximorpha ancoralis* Coq., Can. Ent., xxxiv, 196.

Cheeks yellow posteriorly; face with a small but conspicuous tubercle just above the oral margin; front of female chiefly yellow on the lower third and vertex; first abdominal segment with a peculiar lobe at the basal angles.

Length, 11 to 12 mm.

*Female.* Face yellow, with a median black or ferruginous stripe which joins a triangular area of the same color about the base of the antennæ; cheeks broadly black, reddish or reddish and diffuse yellow behind. Face almost perpendicular, the small tubercule rather conspicuous (shorter and more nose-shaped than in *abbreviata*). Front rarely entirely separated from the face by a black or ferruginous line; on the lower third concolorous with the face, the yellow sometimes narrowly interrupted longitudinally. Front, on either side,

in front of the ocelli, with a coarsely but not densely punctured, moderately shining depression, leaving in the middle a longitudinal convex reddish or brownish line, connecting with the ground color which surrounds the black occellar triangle. Vertex, extending behind the eyes, yellow, in the middle usually interrupted by a reddish or blackish, rather slender line. Front at vertex about three times as wide as the ocellar triangle. Antennal pedicel reddish, or blackish with the base reddish; antennæ brown or black, the first segment a little over half the length of the pedicel; style small. Pile on the front extremely short, on the occiput longer, sparse, whitish.

Thorax black, finely scrobiculate, with about six slender, longitudinal more shining stripes on the dorsum, visible from some angles. Humeri, spots before the outer ends of the suture, mesopleuræ and a longitudinal stripe below, yellow; a yellowish vittula extends forward from the postalar calli; posterior angles of the dorsum sometimes reddish between the corners of the scutellum and the base of the wings; a silvery pollinose stripe often extends inwardly along the suture. Pile of thorax extremely short, fine, whitish. Scutellum yellow, its base narrowly brown or black.

Legs reddish; coxæ black; hind tarsi somewhat fuscous.

Wings brownish or luteous brown anteriorly, almost hyaline posteriorly; the base yellow; the angulation of the third longitudinal vein into the first posterior cell commences further from the anterior cross-vein than in *tridens*, and emits a longer stump of vein into the first posterior cell. Squamæ white, with white fringe. Halteres yellow, the knob reddish.

Abdomen black, finely scrobiculate; sides and anterior angles of the first, posterior margin of the second and third segments yellow; fourth segment with the posterior third, expanding in the middle to occupy a little more than a third, yellow, the yellow with a broad anterior notch in the middle, and concave on either side. On the fourth segment the ground color is obscured by greyish yellow pollen, which is narrowly and almost equally separated from the yellow posterior border, the pollen not quite reaching the lateral margin, gradually narrowed, so that the inner half is not quite as wide as the yellow fascia, the inner ends produced forwards and broadly separated from each other. Somewhat similar but less distinct areas on the third segment; fifth segment with the anterior angles greyish pollinose. The first segment equal in length to the black of the second, the anterior angles strongly convex the convexity limited posteriorly by a line; with a peculiar lobe which occupies the excavated angle; posterior median portion of the segment raised. Second segment almost as long as the third; fourth much longer than the third; fifth segment about equal in length to the width of the yellow band on the fourth. Pile of the abdomen short yellowish white, subappressed; erect basally.

*Male*. Front yellow the yellow narrowly interrupted above by a ferruginous longitudinal line. Pile of the frontal triangle very short fine, whitish, inconspicuous; a little more conspicuous on the vertical triangle.

Legs red, the femora more or less broadly brownish black or piceous, though sometimes the anterior four are more ferruginous than blackish; hind tibiæ with a darker, sometimes brownish band subapically; hind tarsi more or less fuscous, the anterior ones reddish.

Second abdominal band narrowest, the third widest. The depression and ridge on the third segment are almost as in *tridens;* on the fourth segment

the ridge is wider and the pollinose lunule is narrower and its posterior end is only slightly convex, not at all sinuate.

Three males and one female, all from New Mexico; April to August.

This species is readily distinguished from *C. tridens*, with which it might be confused, by the broad third abdominal crossband (which is, however, much narrower than in *tridens*), by the shape and extent of the pollinose lunules on the fourth segment, etc.

## 12. *Cerioides pictula* Loew.

*Ceria pictula* Loew, Neue Beitrage, i, 17. Williston, Synopsis, 261.

I have not seen this species. Williston's description is as follows:

"*Male and female.* Length, 9 mm. Head as in *abbreviata;* the thorax may show an additional yellow spot on the suture; the abdomen, in addition to the posterior yellow margins, has on the second, third and fourth segments each two yellow spots; the second segment is longer as in *tridens;* wings and legs similar or somewhat darker."

The following is a translation of Loew's description:

"Like *C. conopsoides* and *vespiformis* although somewhat smaller than the last; also in the arrangement of the color it compares with this species more than with *conopsoides* with the exception of the yellow spots on the thorax and abdomen which the other lacks. The coloring of the head similar to *conopsoides;* on the thorax there are on the middle also two yellow spots which *C. conopsoides* lacks; there is always a trace of two more yellow spots on the middle of the front border. The abdomen has from the second segment, in addition to the yellow border, two yellow spots. Color of the legs somewhat darker than is usually found in *C. conopsoides.* Wing venation as in *C. conopsoides,* the color wholly darker than in previous species."

Both the species mentioned are European.

## 13. *Cerioides proxima* n. sp.

(Plate I.)

Very similar to *abbreviata* and *tridens,* but lacking the yellow spot at the outer ends of the thoracic suture, the abdomen more constricted basally, the second abdominal segment less convex latrofrontally, etc.

Length, 11 mm.

*Female.* Face yellow, the black extending up a little higher along the eyes than in *abbreviata;* median facial stripe a little broader, tubercle less prominent; front more extensively shining, less densely punctured and not so dull; the yellow of the vertex is interrupted medianly. Antennal pedicel reddish; antennæ brown, the apex of the second segment obscurely reddish. Pile of the head dull yellow.

Disc of thorax dull, the pleuræ shining, the dorsum finely scrobiculate. Humeri, mesopleural stripe and a diamond-shaped spot below, yellow. In some lights a greyish yellow pollinose stripe extends inwardly along the suture. Pile scarcely discernible, apparently brownish. Scutellum yellow, with a fine black border.

Legs reddish brown, base of hind femora and the knees yellow. Coxæ piceous.

Wings brown in front, hyaline behind. Squamæ white, with white fringe. Halteres orange yellow.

Abdomen black, the first segment yellow laterally, the inner limits of the yellow extending obliquely from the corners of the scutellum to the posterior angle. Second segment with a slightly raised shining apical yellow crossband, which is scarcely wider laterally. Third segment with a slightly narrower band which is scarcely raised; the yellow of the fourth segment extends laterally to a little over the outer fourth and is broadest medianly. Pile of the abdomen short, sparse, appressed, yellow; on the fourth segment, black; on the basal angles of the abdomen, erect. First abdominal segment widest just after its base, the anterior margins laterally convex, but not differentiated as in *abbreviata;* the rectangle cut out of the anterior angles is more square; the posterior of the segment is swollen and prominent medianly. Second segment as wide at its base as the apex of the first, the apex of the segment considerably wider than the base; from a lateral view the front portion of the segment is strongly convex. Third segment about one-third longer than the second; fourth slightly longer than the third; fifth short, forming half an oval.

*Male.* Face as in the female. Frontal triangle yellow, the black extending rather broadly to the junction of the eyes; on each side, about half way between the median stripe and the stripe separating the face and front, a triangular blackish abutment which is never present in *C. abbreviata.* Yellow of the vertex moderately broadly (in one specimen not) interrupted.

Thorax, as in the female, no black spot at the outer end of the suture. Legs with the bases of the femora and knees yellow. Abdomen more slender than in *abbreviata,* marked as in the female. Second abdominal segment a little longer than in that species.

Holotype, female; Guelph, Ontario; June 8, 1913 (Curran); in the author's collection.

Allotype, male; Orono, Maine; June 20, 1917 (C. L. Metcalf). Paratypes: Male, Agric. Exp. Sta., Orono, Maine; June 16, 1915 (C. L. Metcalf). Male, Matagamon, East Branch of Penobscot river, Maine; July 4, 1901; in the collection of Doctor Metcalf. This last-mentioned specimen has the yellow of the vertex continuous, but agrees in all other respects.

The male will be distinguished at once from *abbreviata* Loew by the absence of the yellow sutural spot and the shape of the black about the base of the antennal pedicel, and the more slender abdomen; the female, in addition to the more slender abdomen and absence of sutural spots, by the interrupted yellow vertex and the larger yellow spots above the antennæ.

## 14. *Cerioides abbreviata* Loew.

(Plates I and IX.)

*Ceria abbreviata* Loew, Cent., v, 48; x, 57. Williston, Synopsis, 261. Townsend, Trans. Amer. Ent. Soc., xxii, 54. Fluke, Trans. Wis. Acad., xx, 249 (Sphiximorpha). Jones, Syrph. of Colo., 40, 58.

Antennal pedicel longer than the first antennal segment; second abdominal segment only a little longer than the first.

Length, 9 to 10 mm.

*Male.* Face shining yellow; the cheeks and the contiguous lower part of the face extending to the upper third, a narrow median facial stripe which is slightly broader below and connecting with the narrowly black oral margin, expanding at its upper end to join the black about the base of the pedicel,

arcuate stripes leading from the pedicel to the orbits, and a narrow stripe dissecting the yellow of the frontal triangle vertically, shining black. Frontal triangle yellow, except about the pedicel, the black between the frontal stripe and the stripe separating the face and front, regular in outline, without an angular abutment. Face in profile perpendicular, not excavated or produced, retreating just at the oral margin, above which there is an indication of a longish, not conspicuous tubercle. Vertical triangle long, black, a stripe along the vertex yellow. Eyes touching for a short distance. Pile restricted to the occiput and vertical triangle, fine, sparse, white. Antennal pedicel longer than the first segment, almost cylindrical, a little enlarged apically, in color luteous reddish or red, the middle portion sometimes darker. First antennal segment luteous on the basal half, somewhat brownish apically; second segment not quite as long as the first, brown, its end obscurely reddish; third segment shorter than the second, brownish or reddish; style short, its end sharply pointed.

The dorsum of the thorax black, finely scrobiculate, pleuræ shining; humeri, a small spot at the outer end of the suture, an elongate spot on the mesopleura and a smaller, longitudinal one below it, shining yellow. Sometimes a greyish pollinose line extending inwards along the suture. Postalar calli brownish. Scutellum yellow, with an entire border of brownish or blackish. The hairs of the thorax are extremely short, blackish, the upper part of the pleuræ with fine, sparse, whitish hairs, lower part bare.

Coxæ black, trochanters piceous reddish. Femora black, their apices and the base of the hind ones yellowish red; tibiæ reddish brown, their bases narrowly yellow. Tarsi light brown, the first two segments of the middle ones reddish.

Wings brownish in front, hyaline posteriorly; stigma pale, with a darker basal spot. Squamæ yellow, with a fringe of short, yellowish hairs. Halteres yellow.

Abdomen moderately shining black, finely scrobiculate. Sides of the first segment broadly yellow; posterior third of the second segment, increasing to half at the sides; the posterior margin of the third; posterior margin of the fourth, more broadly in the middle, yellow. Abdomen with sparse, appressed, almost whitish short hairs, which are erect on the sides of the first segment; on the disc of the first segment the hairs are blackish. First segment almost as long as the second, the latrofrontal border convex, raised, the apex of the second wider than its base, the apices of the first two segments of about equal width. Second segment about two-thirds as long as the third, the yellow apex swollen or raised, the apex of the segment shallowly emarginate in the middle and on either side; third segment not quite as wide as the second, much more convex above, the yellow border very slightly raised. Fourth segment as much longer than the third as the width of its yellow apex. On the third and fourth segments there is a slight anterior, longitudinal rounded ridge.

*Female.* Facial black stripe about twice as broad, the black stripe separating the face and front much broader, above which the ground color is black; opposite the antennæ a triangular orbital yellow spot; above the antennæ two small, broadly separated spots of rather indefinite outline. Above these spots the front is dull and rather densely punctured, excepting a shining, smooth median stripe running to the more shining ocellar triangle. Vertex as in the male.

Second abdominal segment about half as long as the third in the middle and the width of the yellow apices of the segments about equal. The fourth segment is somewhat yellowish dusted in the middle; its apex is yellow on about the middle half; shorter in the middle than the third, longer laterally. Fifth segment shining black, with black pile. The median convexities of the third and fourth segments are more prominent, and that on the third segment extends the whole length. The legs are more reddish, the blackish color being restricted to the bases of the anterior four femora and the under side of the hind ones. The tarsi are reddish, the hind ones brown.

Eight males and 12 females; Kansas, Colorado, Ontario, Ohio; June and July. The species has also been reported from Pennsylvania, Florida, Connecticut, Virginia, New York, New Jersey and Wisconsin.

*Cerioides proxima* n. sp., is the only species with which *abbreviata* is likely to be confused, and it may be at once distinguished by the presence of the sutural spot at the outer end of the thoracal suture, more robust appearance, color of the front, etc.

## SUBFAMILY MICRODONTINÆ VERRALL.

Antennæ elongated and porrected, rarely shorter and somewhat drooping. Eyes of the males narrowly or widely separated; if narrowly so, the sides of the front parallel and the ocelli placed well forward. Face rather densely pilose; in profile usually at least slightly convex, receding below. Antennæ with a basal, bare arista. Eyes usually bare. Scutellum frequently armed with spines, but sometimes only emarginate, or even evenly rounded. Legs usually rather stout. Wings short and broad, the third vein usually emitting a stump of vein into the first posterior cell; anterior cross-vein near the base of the discal cell; apical cross-vein usually recurrent. Abdomen variable.

This subfamily is a remarkably interesting one, and the members, even within a single genus, exhibit remarkable variations of form and characteristics. The abdomen may be pedicellate, thus approaching in shape *Cerioides*, *Paragus* (exotic species) and *Neoascia*. Apparently all the members possess the stigmatical cross-vein. The wing venation is characteristic, but even here there are many variations. It is the variations which occur in this subfamily which would seem to indicate that these are the most primitive members of the family, as practically all the characteristics found here occur also in species or groups belonging to various other subfamilies. I have indicated these more or less in my discussion of the classification.

In North America we have but two recognized genera, *Mixogaster* and *Microdon;* but the genus *Omegasyrphus*, which I have dealt with as a subgenus of *Microdon*, appears sufficiently characterized to rank as a genus.

## GENUS MIXOGASTER Macquart.

*Mixogaster* Macquart, Dipt. Exot., ii, 2, 14; 1842. Kahl, Kans. Univ. Quart., vi, 140; 1897. Hine, Ohio Nat., xiv, 334; 1914.

I have not Macquart's description of the genus, and therefore cannot be sure of the specific limitations which have been used. Hine states that some of the species might well belong to *Microdon* were it not for the distinctly clavate abdomen. However, in the single species occurring north of Mexico there can be no confusion with any other genus.

The face is very much as in *Cerioides*. The first and third antennal segments are elongate; arista dorsal, bare. Abdomen clavate, not pedicellate, as the second segment broadens rather suddenly from its narrow base, the sides thence almost parallel. The third longitudinal vein of the wings is perfectly straight; apical cross-vein rectangular or scarcely recurrent; posterior apical cross-vein strongly recurrent. I cannot make out any hair on the humeri in the specimen before me, and if such does not occur an interesting relationship with the Syrphinæ is indicated.

### 15. *Mixogaster breviventris* Kahl.

(Plate IX.)

Kans. Univ. Quart. vi, 137.

Length, 11.5 mm.; wings, 8 mm.; body, 7.5 mm.

*Male*. Face yellow, a slender median stripe rising below the antennæ and not quite reaching the oral margin, and the cheeks, except posteriorly, brown. In profile the face is a little convex immediately below the antennæ, thence slightly receding to its lower fifth, where it is concavo-receding to the anterior oral margin, which is the lowest point of the face and is situated below the inferior border of the eyes; face produced a little downwards. Pile of face subappressed, sparse, fine, whitish, with indications of some blackish hairs above the oral opening. Front scarcely narrowed before the middle, in front with a depressed transverse area, most of which is a densely punctured brownish ground, but there is a squarish, more shining area above the base of the antennæ. The upper part of the front appears swollen and is orange yellow in color, the ocellar triangle brown, with a posterior contiguous oval spot. The brown color of the occiput encroaches a little on the yellow color at the vertex, giving the appearance of the narrowing of the front. Pile of the front and posterior orbits sparse, yellowish. Eyes widely separated, bare. Antennæ situated upon somewhat reddish ground; first two segments reddish yellow; third segment very elongate, brown, its base reddish, strongly constricted in its middle; arista reddish, over half the length of the third segment. Lengths of the antennal segments: first, 0.75 mm.; second, 0.2 mm.; third, 1.75 mm.

Thorax peculiarly greenish yellowish, shining; pectus black; about the wings and extending broadly down to the pectus and more or less diffuse all along the black color, of a port-wine reddish color. Dorsum of thorax dull blackish brown, becoming more yellowish brown posteriorly, the sides broadly yellow; suture yellowish. Scutellum wholly yellow; postscutellum prominent, brown. Pile short, subappressed, yellow on the dorsum; pleuræ bare except some short, sparse pile below the wings.

Legs yellow, largely with a wine-red tinge.

Wings broadly brownish luteous along the veins before the spurious vein;

hyaline posteriorly; stigmatical cross-vein present. Apical cross-vein curved a little basad on its front portion, but almost straight; last section of the fifth vein strongly recurrent, but joining the fourth longitudinal vein at a right angle. Squamæ narrow, brownish, with brown border and extremely short brown pile. Halteres yellow, the basal third wine red.

First abdominal segment a little wider than the base of the scutellum, narrowed to its apex; second segment greatly widened posteriorly, where it is as wide as the head, its lateral margin a little concave on its basal third; laterally with a distinct raised margin. Third and fourth segments gradually slightly narrowing, but the sides almost parallel, without a distinct raised margin. First segment a little wider than long, second over twice as long as the first, the two following successively longer, the fourth about equal in length to the first two combined. First segment yellow, its hind margin, extending broadly forward on the median half, port-wine colored. Second segment of a peculiar wine-red color, the base port-wine color, emitting a median stripe caudad on the basal half, the apex broadly incompletely yellow. Somewhat more than the basal third of the third segment blackish, emitting triangular median and lateral projections caudad, which do not reach the posterior margin, the black bordered more or less broadly by wine red; remainder of the segment yellow or reddish yellow. Fourth segment similarly colored, the median caudad projection broad, long, and with nearly parallel sides, the lateral projections elongate triangular, all broadly separated from the posterior margin. Genitalia yellow and wine red. Pile short, appressed, yellowish, erect only on the sides of the first segment. Venter wine red, the third and fourth segments black on the chitinized plates; apex of the third segment yellow, of the fourth red.

I am not at all sure that this is *M. breviventris* Kahl, as the specimen seems too elongate; the lengths of the segment and the color pattern do not agree; but it may be that there is this amount of variation between the sexes. My single specimen is from Florida.

Following is Kahl's description, which was drawn from the single female type from Kansas:

"*Female.* Shining, especially conspicuous on sternum, pleuræ and coxæ. Face sparsely covered with yellow pubescence, not projecting more at the oral margin than at the antennæ; gently convex, at the insertion of the antennæ, not protuberant; yellow, with a large blackish brown, longitudinal median spot, which is gradually dilated from the base of the antennæ to the lower third of the face, thence contracted to a somewhat acute angle, not quite reaching the oral margin; the spot is black along its middle; across the cheeks from the eye to the oral margin a blackish band, behind it a yellow patch, thinly covered with whitish yellow pollen and connected with the yellow of the posterior oral margin; the sides of the lower half of the face with extremely short, light yellow pubescence. Front immediately above the antennæ with a broad, almost black, transverse band, reaching the eyes and two-thirds of the distance between base of and anterior ocellus; above this band there is a yellow, scarcely narrower one, reaching the eyes and encroaching upon the vertex as far as the posterior ocelli; below the yellow band the front is very slightly depressed; on the sides of the black crossband a broad depression, which is continued on the face a short distance as a well-marked arcuate line, reaching the eye; the surface of the sides of the front uneven, somewhat wrinkled; immediately above the antennæ the surface is smooth, more shining, of brown color, not black like the rest of the crossband. Vertex behind the yellow frontal crossband black, including the ocellar tubercle, which consists merely of a slightly elevated ring with the space between the ocelli

somewhat concave, by no means convex; behind the ocelli a slightly elevated tubercle; front sparsely provided with short, erect fuscous pile on the black band, somewhat lighter on the yellow one; on the vertex the pilosity is fuscous, yellowish at the occiput, more abundant and longer than that of the front. Occiput black, sparsely yellowish pilose above; at the middle with short, at the outer part with longer, sparse whitish yellow pile; superiorly very thinly yellowish pollinose; at the middle of each side a large, distinct, white pollinose patch. Antennæ with the first joint yellowish brown beneath, a little darker above, its length about the same as the distance between its base and the anterior ocellus, its vertical width at the apex fully one and one-half times greater than that of base, above and beneath with blackish pubescence; second joint very short, brown, at base darker, scarcely broader than the apex of first, but at least five times shorter than that joint; third joint thickened, much elongated, fully two and one-half times as long as the first, narrowed in its middle, dark brown; arista situated near the base of the third joint, yellowish brown, its extreme base black, not reaching as far as the apex of that joint. Eyes bare, the inner orbits almost parallel and rather broadly separated.

"Thorax black; the broad lateral border of the metanotum to the scutellum, including humeri, mesopleuræ, upper part of sternopleuræ, upper part of hypopleuræ and most of metapleuræ, pale yellow; the yellow of the pleuræ forms a large semicircular band interrupted only at the posterior side of the sternopleuræ by a narrow black stripe connecting the black of pteropleuræ with that of the sternum. Scutellum short, considerably convex, translucent, pale yellow, the extreme base and a dot on the lower lateral angle brownish; the furrow between the mesonotum and scutellum deep.

"Abdomen short, a little wider than thorax; blackish brown; first segment rectangular, three times as short as its width, the latter about the same as between the eyes on the vertex (not wider), above yellow, with a narrow brown, basal band not quite reaching the lateral margin; second segment short, as long as the third, its lateral outline seen from above slightly concave before the middle; first and base of second segments form together a very short peduncle; third and fourth segments of equal width, the fourth hardly longer; fifth as long as the third, its distal end only half as wide as its base; the whole posterior margin of the second, third, fourth and fifth dorsal segments broadly bordered with yellow, that of the second segment of equal width throughout, that of the third, and a little more so of the fourth, slightly widening at sides, that of the fifth considerably dilated laterally as far as the middle of the segment; ventral segments blackish brown, the first one yellow with a brown patch in its middle, the fourth following segments with posterior margins narrowly yellow, obsolete on the fifth, base of the second also with a narrow, yellow, transverse band not reaching the lateral margins; ovipositor dark brown, its two oval appendages reddish, brown. To the naked eye the whole insect appears almost bare, and its ground color is in no way concealed by the minute pubescence. Mesonotum rather densely, scutellum very sparsely, the whole blackish portion of the second and third dorsal, fourth dorsal at its base and sides, fifth dorsal at the extreme base only and the blackish portions of the ventral segments provided with minute blackish brown pubescence; the posterior yellow margins of the dorsal and ventral segments with yellow pubescence, extending on the fourth dorsal to the middle of the black portion; on the fifth dorsal it extends almost over the whole segment; on the sides of the first segment and on the ovipositor the pubescence is longer and yellowish.

"Legs, rufous, coxæ black, middle and hind trochanters and apical two-thirds of the hind femora, dark brown; basal two-thirds of all the tibiæ pale yellow; hind femora not unusually thickened and the hind metatarsi moderately dilated. Halteres brown, with yellow knob."

The wings are described in great detail; in general I can see no difference worthy of note.

## GENUS MICRODON Meigen.

*Microdon* Meigen, Illig. Mag., ii, 275, 1803; Syst. Beschr., iii, 162, 1822. Schiner, fauna Austr., i, 249; 1862. Williston, Syn., 3, 1886; Biol. Dipt. iii, 2, 1891. Wheeler, Psyche, July, 1901. Verrall, Brit. Flies, viii, 658; 1901. Chagnon, Et. Prelim. les Syrph., 13, 190; 1901. Lundbeck, Dipt. Dan., v, 578; 1916. Bezzi, Syrph. Eth. Reg., 119; 1915. Fluke, Wis. Acad. Sci., xx, 222; 1922. C. R. Jones, Syrph. of Colo., 17; 1922.

*Aphritis* Latreille, Hist. Nat. Crust. et Ins., xiv, 358; 1805.

*Ceratophyia* Wiedemann, Auss. Zweifl., ii, 79; 1830.

*Dimeraspis* Newman, Ent. Mag., v, 372; 1838.

*Mesophila* Walker, List, etc., iv, 1157; 1849.

*Ubristes* Walker, Dipt. Saund., 217; 1856.

*Omegasyrphus* Giglio-Tos, Boll. Mus. Zoöl., vi, No. 108, 4, 1891; Ditt. del Mess., i, 38, 1892.

This genus may be characterized by the usually convex, very pilose face; eyes dichoptic, front broad; eyes usually bare; antennæ elongate, usually porrect, and usually longer than the face; thorax and abdomen usually stout and more or less thickly pilose, rarely marked with yellow, never fasciate; legs stout; wings short and broad, the anterior cross-vein near the base of the discal cell; apical cross-vein usually recurrent, rarely outwardly angulated near its middle; third vein usually emitting a stump of vein into the first posterior cell. Scutellum frequently armed with a short, stout spine on each apical angle or apex at each side of the middle line, the spines separated by varying distances in the different species.

The genus is such a variable one that many attempts have been made to divide it into several genera, but further knowledge of the species has invariably led to the union of the groups split off. *Aphritis* Latreille was established for the same species to which the name *Microdon* had already been applied by Meigen, and is an absolute synonym. *Ceratophyia* Wiedemann included all those species in which the scutellar spines were absent, but this character is not of value owing to the gradual merging into typical *Microdon*. The genus *Chymophila* Macquart, which I have omitted from the synonymy, was established upon a specimen of *Microdon* with the head of a conopid glued on, and hence the genus must be dropped altogether. *Dimeraspis, Mesophila* and *Ubristes* are also included within the limits of *Microdon* as generally accepted, and were founded upon characters which are of practically no generic value, but possessing specific significance.

The subgenus *Omegasyrphus* is, perhaps, entitled to generic rank, because of the specialization of the second abdominal segment, which does not, as Knab indicated, connect closely with *Microdon*, through *M. craigheadi* Walton. While the latter is certainly very similar to *Omegasyrphus* superficially, an examination will at once disclose the fact that while the depressions on the second segment are very similar, yet the outline of the segment is never alike; also the antennæ of *Omegasyrphus* are always more or less drooping, due to the curvature of the first segment, and they are never properly porrect.

In addition to this subgenus I propose the subgenus *Eumicrodon* for *M. fulgens* Wied. and *aurifex* Wied., the former the type of the subgenus.

The adults are rather sluggish fliers and are found usually on leaves in shady places or in long grass in the vicinity of ants' nests. The larvæ live in ants' nests and are thought to act as scavengers. It is said that the ants seldom bother them, but little is actually known regarding the relations existing between the ants and the intruders. They are peculiar creatures, elongate oval in shape, strongly convex, the venter flattened and without feet; the

sides are usually fringed with fleshy spines and the integument is covered with shorter and longer spines. The pupæ, which are of the same shape as the larvæ, are found near the exits from the ants' nests. They are such extraordinary appearing individuals that they have more than once been described as species of Mollusca, and in 1907 Simroth described what is undoubtedly a puparium of *Microdon* as a new species of slug, giving it a new generic name.

Wheeler states that the larvæ and pupæ are also found in the nests of termites and wasps. In the nests they seem to be gregarious, so that several may be seen clinging to the walls of galleries and chambers.

"The larval and pupal stages of these singular insects are found only in the nests of ants, wasps and termites. Wasmann (1890) seems to be the only author who has seen them in wasps' nests. In his list of myrmecophiles and termitophiles (1894) he mentions their occurrence also in the termitaria of Madagascar and Brazil. Most frequently, however, both in temperate and tropical regions, the larvæ and pupariæ are found living with ants. In these stages the insects are gregarious, as a rule, so that many of them may be seen clinging to the walls and chambers. They seem to live indifferently in nests in the soil, under stones, under the bark of trees, or in the cavities of branches. The larvæ, while young or partially grown, often inhabit the deeper recesses of nests, but when they reach maturity and are ready to pupate, they emigrate to the surface and are then found near or at the entrances. They creep very slowly, with a wavelike motion of the flat and viscid ventral surface, which so closely resembles the foot of a slug, and keep the fringed border of the body in close contact with the surface over which they are moving. The anterior end, however, is occasionally raised for a few moments. At such times one may see the small pointed head of the larvæ moving about uneasily under the fringed border, as if in search of food. What this food is has not been determined. Laboulbene (1882) surmised that it might be the ant larvæ, but I am inclined to think that it is the minute pellets of food, which, after their moisture has been extracted, are ejected from the hypopharyngeal pockets of the worker ants. These pellets are scattered about the nest, especially about the superficial galleries, and, though hard and dry, must contain considerable nutriment. They are probably eaten not only by the *Microdon* larvæ, but probably also by many other synoeketes.

"The larvæ of the common European and North American *Microdon* are usually of a dirty white or drab color, with yellow or brown fringes of hairlike processes around their creeping sole, and a prominent, heavily chitinized tubercle near their posterior end. Usually no traces of segmentation are to be observed on their elliptical bodies, but in some adult larvæ of *M. tristis*, just before pupation and after their upper surfaces have been dried by the air, I have been able to discern in certain lights a distinct division of the body into seven or eight subequal segments. When the time for pupation arrives the larva remains stationary on its creeping sole, contracts somewhat, becomes harder and more convex and of a deeper brown color. The reticulations or markings with which the upper surface is sometimes ornamented become more pronounced, and a pair of short tubercles or protuberances make their appearance near the anterior end in addition to the single respiratory tubercle at the posterior end.

"I am convinced that there is but one annual brood of these insects, at least in temperate climates, and that the larvæ, after passing the winter in the ant nest, pupate in April or May." (Wheeler, Studies in Myrmecophiles, III, Journ. N. Y. Ent. Soc., xvi, 202.)

So far as I am aware no more detailed account of the habits of the larvæ has ever been published than that of Wheeler, who deals at length with the relationships between their hosts and the larvæ, pupæ and adults of several North American species. I have secured adults of *M. manitobensis* from pupæ sent me by Dr. A. J. Hunter, Teulon, Man., found in the nests of ants in logs. My own efforts to locate larvæ have been exasperatingly futile.

## SYNOPSIS OF THE SPECIES STUDIED.*

1. Second abdominal segment almost evenly convex laterally, dorsally with a transverse depression and sublateral depressions; second abdominal segment almost equal in length to the third; antennæ not decidedly porrect; more slender species (subgenus *Omegasyrphus*)..... 28

   Second abdominal segment broadest posteriorly or with the sides practically parallel; sometimes with depressions on the second segment; antennæ porrect; sometimes slender, but usually robust species..... 2

2. Apical cross-vein with an outward angulation; second abdominal segment long laterally, giving the abdomen a squarish base, its sides practically parallel; base and apex of scutellum parallel, the apex very broad (subgenus *Eumicrodon*)..... 3

   Apical cross-vein usually recurrent, but never with a distinct outward angulation; second abdominal segment narrower basally..... 4

3. Last two abdominal segments, in the female at least, golden colored ..... *aurifex* Wied.

   Last two abdominal segments only golden laterally and on the posterior borders, although sometimes the last segment is rather extensively golden ..... *fulgens* Wied.

4. Eyes pilose (subgenus *Serichlamys*)..... *rufipes* Macquart

   Eyes bare ..... 5

5. Posterior ocelli remote (*i. e.*, further from each other than from the anterior ocellus; in the *conflictus* group, which are all more or less reddish flies with the hind basitarsi swollen, there may be some doubt, but the broad face places them in this section)..... 11

   Posterior ocelli not remote, the ocellar triangle small, the sides almost equal ..... 6

6. Small, slender, metallic greenish species; scutelar spines not unusually approximated; eyes finely pilose..... *scitulus* Williston

   Not very small and slender..... 7

7. Ocelli half way between the vertex and the frontal groove; second abdominal segment with a deep basal and deep sublateral depressions, scutellum with moderately separated spines; color metallic green or with the last two segments cupreous..... *craigheadi* Walton

   Color not metallic green; depressions on second segment not so distinct, the segment broadest apically; scutellum variable..... 8

8. Male: Hind basitarsi much swollen; scutellum emarginate apically, but without spines or tubercles; ocelli only slightly before the posterior angles of the eyes; short, robust species..... *globosus* Fabr.

   Hind basitarsi not exceptionally swollen; scutellum variable; more elongate in form ..... 9

9. General color metallic violaceous; hind basitarsi not swollen; scutellum with stout spines on each side of the slight apical concavity (Jamaica) ..... *violens* Townsend

   General color not violaceous; apex of the scutellum more or less excavated ..... 10

10. Front at the vertex decidedly wider than the face; spines of the scutellum strong, approximate, pilose..... *diversipilosa* n. sp.

    Front at the vertex not wider than the face; scutellum with broadly separated, small, sharp spines which are not pilose..... *cutristis* n. sp.

11. Hind basitarsi of the male greatly enlarged; ocellar triangle small; color more or less piceous reddish, the females more brown with very broad abdomen, being dissimilar to the males, which are short, compact ..... 12

* For descriptions of species not included in the key see: *viridis* Towns., *senilis*, *modestus*, *scutifer* Knab, *coloradensis* Cock. and Andr. I am unable to include them without examination.

Hind basitarsi not unusually enlarged; ocellar triangle larger, the posterior ocelli usually very distinctly remote, but sometimes irregular, so that one may be closer to the front ocellus; females very similar to the males ..... 15

12. Pile rather long, whitish; third antennal segment nearly twice as long as the first ..... *albipilis* n. sp.

Pile not so conspicuous; third antennal segment not over one and one-half times as long as the first ..... 13

13. Third antennal segment large basally, gradually narrowing to its stout apex; scutellum moderately and rather narrowly excavated, *marmoratus* Bigot

Third antennal segment not much thicker basally than apically ..... 14

14. Squamæ yellowish; scutellum deeply and narrowly concave, usually with oblique furrows ..... *conflictus* n. sp.

Squamæ almost white; scutellum moderately and more widely excavated ..... *pseudoglobosus* n. sp.

15. Third antennal segment short, lance-shaped; scutellum without spines; head wholly yellowish pilose; legs wholly blackish..*lanceolatus* Adams

Third antennal segment not lance-shaped; scutellum, etc., variable.... 16

16. Scutellum without spines or strong tubercles, although possibly slightly emarginate ..... 17

Scutellum deeply emarginate or with spines or strong tubercles..... 19

17. Scutellum with the end evenly rounded, not at all emarginate; third antennal segment longer than the first; arista short, spear-head shaped ..... *fuscipennis* Macq.

Third antennal segment shorter than first; arista slender..... 18

18. Face and thorax metallic greenish bluish; pile bright brassy yellow; scutellum distinctly emarginate ..... *xanthopilis* Towns.

Face and thorax more or less bronzed; pile pale brassy yellow; scutellum indistinctly emarginate..... *cothurnatus* var. *similis* Jones

19. Abdomen wholly black pilose beyond the second segment; legs black, *megalogaster* Snow

Abdomen more or less yellow pilose beyond the second segment..... 20

20. Front black pilose except at the vertex and a few hairs across the middle; legs black; color metallic blue-green; abdomen black pilose beyond the third segment..... *piperi* Knab.

Front, abdomen, or both, more extensively yellow pilose..... 21

21. Abdomen metallic blackish green, the pile often golden; large, robust species ..... 22

Abdomen not metallic greenish; pile more yellow or fulvous..... 23

22. Vertical bump very prominent; pile not purely golden, but brassy yellow ..... *ocellaris* n. sp.

Vertical bump not very prominent; pile golden yellow or golden, *aurulentus* Fabr.

23. Spines of the scutellum pilose; posterior ocelli only a little remote, *ruficrus* Williston

Spines of the scutellum usually smaller, not pilose..... 24

24. Scutellum inflated, the spines small or very small, situated well above the flat ventral margin; front evenly rounded..... 25

Scutellum with the spines larger; situated on or very close to the flat ventral margin ..... 26

25. Pile of the scutellum usually bright fulvous or reddish; some black hairs across in front of the scutellum; face greenish with a brassy reflection; legs wholly black; spines larger..... *manitobensis* n. sp.

Pile of head and scutellum wholly pale yellowish; face often reddish or piceous, legs more or less yellow; spines very small, *cothurnatus* Bigot

26. Third antennal segment very long; ocelli situated on a triangular raised area which is continued back to form a very prominent vertical bump; front granular; spines of the scutellum widely separated; posterior ocelli distinctly remote.....*tristis* Loew

Third antennal segment shorter; ocelli not situated on a well-marked triangle which is continued back to form a vertical bump, although the latter may be present ..... 27

27. Front black pilose above and below the groove; antennæ black, third segment obtuse apically .....*champlaini* n. sp.

Front wholly golden yellow pilose; antennæ reddish basally, third segment more sharply rounded above apically.....*basicornis* n. sp.

28. The black clouds across the wings broadly connected anteriorly, *pallipennis* n. sp.

The black clouds on the cross-veins are isolated..... 29

29. Abdomen metallic bluish .....*coarctatus* Loew

Abdomen not metallic bluish ..... 30

30. Abdomen almost all piceous reddish.....*painteri* Hull

Abdomen largely metallic blackish green.....*baliopterus* Loew

## Subgenus SERICHLAMYS, new.

### 16. *Microdon rufipes* Macquart.

*Aphritis rufipes* Macquart, Dipt. Exot., ii, 2.

*Microdon rufipes* Williston, Synopsis, 12. Johnson, Ent. News, xii, 95.

"Face of a blackish green, with yellowish pile. Front blackish blue, with yellow pile, with a transverse groove. Antennæ: first joint blackish, the two others testaceous. Eyes thinly pilose. Thorax with four purple lines on the metallic blackish green ground color; scutellum blue; points covered with whitish pile. Abdomen oval, of a dark violet blue; second segment with a band of whitish pile on the posterior border, interrupted in the middle and enlarged at the sides; third segment with a longitudinal stripe of similar pile equally interrupted and united at the extremity. Legs reddish colored, base of the femora black. Halteres yellowish. Wings at the base and exterior front border yellowish; all the veins bordered with brownish; first posterior cell terminating in an angle and appendiculate." (Translation by Williston.) Pennsylvania and Louisiana.

## Subgenus EUMICRODON, new.

### 2. *Microdon fulgens* Wiedemann.

(Plate III.)

*Microdon fulgens* Wiedemann, Auss. Zweifl., ii, 82. Williston, Synopsis, 11. Knab, Proc. Biol. Soc. Wash., xxx, 140.

*Microdon cuglossoides* Gray, in Griffith's An. Kingd., Ins., ii, pl. cxxv, f. 2.

*Aphritis fulgens* Macquart, Dipt. Exot., Suppl. i, 122.

Eyes very short, pilose. Large, brilliant metallic green or blue green, the face widest at the upper fourth; ocelli half way between the vertex and frontal constriction; scutellum transverse, almost as wide apically as basally, with spine at each apical corner.

Length, 13 to 15 mm.

*Male*. Face narrow, about as wide as one eye from a direct frontal view, a little wider at the upper fourth than below; wholly without side depressions;

in color brilliant metallic greenish blue; in profile, convex, more strongly so below. Pile rather cinereous yellow, opposite the antennæ chiefly fuscous, on the sides along the eyes shorter and much condensed. Front moderately constricted at the lower third, at the vertex not as wide as the face; with a very strong transverse depression at the constricted point, and above the antennæ, when viewed from above, with an impressed V inclosing a polished area above the antennæ, the V reaching to the transverse depression; a smaller V inclosed just above the antennæ. Upper part of the front with fine longitudinal wrinkles on the sides. Ocelli equidistant. Vertical bump small but conspicuous and leaving a more prominent convexity when viewed from in front. The pile is intermixed yellow and black about the antennæ and on the sides before the ocelli, black across and ocelli, yellow or cinereous above. Occiput brilliant green, with a strong rather angular ridge well back from the eye margins, and, when viewed from above, yellowish polinose; bearing yellow pile. Pile of the eyes very short and sparse, rather cinereous. Antennæ situated upon luteous ground; reddish brown, a reddish color showing in some lights; end of the second segment and base of the third, reddish; third segment very elongate, a little curved upwards, its end obtusely rounded, a little longer than the first segment; second segment about one-fourth as long as the first. Arista about three-fifths the length of the third segment.

Thorax brilliant metallic greenish blue, the pectus purplish blue; on the dorsum in some lights with a brassy cast, and chiefly behind the middle with a pair of contiguous elongate brilliant cupreous spots which diverge posteriorly. Pleural sutures reddish or piceous. Pile semirecumbent, fulvous yellow, but on the disc behind the suture and reaching somewhat cephalad of its inner ends, or sometimes wholly except the broad front and narrow lateral margins, brownish or blackish with sometimes a few yellow hairs intermixed. Scutellum metallic blue, rectangular, its base only a little wider than its apex, which is parallel with the base and bears at each apical corner a metallic blue, small spine.

Femora and the legs anteriorly of the same metallic blue color, beneath more purplish, but in some lights the tibiæ appear dull; tarsi almost dull brownish. The legs bear chiefly black or brown short pile, but it is long on the outer sides of the tibiæ.

Wings not quite hyaline, slightly yellowish tinged, the stigmatic cross-vein strong. The last section of the fourth longitudinal vein is bent outwards at its basal third and then curves inwards on its apical fourth so that a characteristic loop is formed and there is a short stump of vein outside the posterior of the curvature and also at the tip of the primary section of the fourth vein. The stump of vein into the first posterior cell is curved a little outwards. Squamæ white, with golden fringe. Halteres yellow.

First three abdominal segments metallic greenish blue, rather coarsely punctured, the fourth reddish apically and laterally and with a strong brassy reflection elsewhere, or the red may be almost all restricted to the apex and the abdomen may have a brassy reflection on most of its surface. Second abdominal segment in the middle, scarcely longer than the first, which is chiefly hidden beneath the large scutellum, the second remarkably produced forwards at the sides, so that its very large, prominent swollen anterior angles are almost as far forward as the extreme anterior angles of the first segment. There is a small depression inside the basal angles which is largely filled with opaque

black pollen. Third segment about four times as long as the second; with a large depression inside the posterior angles contiguous with one on the base of the fourth segment (see Plate III), (all the depressions shown in the figure, Plate III, are visible from certain views). On the basal third of the third segment there is an opaque blackish crossband which does not nearly reach the lateral margins and before which the color is deeper blue, and there are four rather conspicuous furrows. Fourth segment not quite twice as long as the third, on the basal angles with a broad, shallow depression continuous with that on the third segment; when viewed from in front with the usual V-shaped impression extending from the basal half to inside the posterior angles. Pile on the basal two segments, except on the sublateral area of the second segment, yellowish; elsewhere on the side margins and following the depressions onto the disc, rusty golden reddish, elsewhere black. First two ventral segments metallic green, the sutures and remainder of the venter reddish, the pile yellow, more reddish apically.

Description drawn from: Male: Forked River mountains, New Jersey; July 8, 1906 (C. W. Fenninger); Daecke Collection. Male; Billy's Island, Okefenokee Swamp, Georgia; June, 1912.

This is one of our most beautiful flies and a very striking species anywhere. It may be readily recognized from all but the following species by the *Volucella*-like venation, remarkable scutellum and brilliant color. It seems probable that *M. aurifex* is a synonym, but in the absence of specimens agreeing with the description of that species, I am not in a position to judge. It may not even be similar in structure, and the eyes may not be pilose.

## 18. *Microdon aurifex* Wiedemann.

*Microdon aurifex* Wiedemann, Auss. Zweifl., ii, 85. Williston, Synopsis, 9. Biologia, Dipt. iii, 2.

*Aphritis aurifex* Macquart, Dipt. Exot., ii, 3, 11.

*Microdon trochilus* Walker, Ins. Saund., 216 (Will.).

"Bright metallic green with violaceous reflections; tip of abdomen yellow; legs black.

"Length, 10 mm.

"*Male.* Antennæ blackish brown, first and third segments of nearly equal length. Face rather narrow, moderately swollen, white pilose. Front with black pile, considerably narrowed in the middle, where its breadth is less than half the distance between antennæ and ocelli. Eyes sparsely pilose. Dorsum of thorax with moderately abundant erect black pile; in front and on the sides, with sparse light yellow pile. Scutellum large, trapezoidal, covered with light yellow pile; spines small and remote. Abdomen less violaceous than the thorax, nearly bare; first segment with yellow pile, second with an anterior opaque black crossband; hypopygium wholly reddish yellow, not shining. Legs black, with a greenish reflection, especially on the hind pair; pile black, rather long, fringed on the outer side of the tibiæ, particularly of the hind pair; hind tarsi considerably dilated. Wings nearly uniformly cinereous; posterior crossvein not much inflected, without stump.

"This species must resemble *M. aurulentus*, but there are differences from Fabricius' brief description, as Wiedemann pointed out, and especially from Macquart's, whom, it may be supposed, examined the type in Bose's museum at Paris. It is also evidently related to *M. inequalis* Loew, but differs especially in the pile of the thorax." (Williston.)

I am not sure that this is Wiedemann's *M. aurifex*, as the legs do not agree, and there are other discrepancies. Following is a translation of Wiedemann's brief description, which is of the female.

"Antennæ black; face and front greenish golden; thorax, and abdomen with the first three segments similar in color, the last two abdominal segments almost pure golden. Wings brownish yellowish. Legs with the femora green-golden, tibiæ a little green-golden, tarsi almost black. Length, 10 mm. Female.—Brazil."

I do not know this species but suspect that it, at least the specimen described by Wiedemann, is conspecific with *M. fulgens*, being a small specimen with the end of the abdomen more extensively reddish golden.

## Subgenus MICRODON.

### 19. *Microdon globosus* Fabricius.

(Plate IX.)

*Mulio globosus* Fabr., Syst. Antl., 185.
*Microdon globosus* Wied., Auss. Zweifl., ii, 86. Williston, Synopsis, 4.
*Aphritis globosus* Macquart, Dipt. Exot., ii, 2, 13.
*Dimeraspis podagra* Newmann, Ent. Mag., v, 373.
*Microdon fuscipennis* (Macq.) Aldrich, Cat., 346 (after Snow; other records doubtfully refer to this species.)

Face not as wide as one eye; general color usually reddish or luteous reddish; ocelli placed before the posterior angles of the eyes.

Length, 8.5 to 10 mm.

*Male*. Head fuscous reddish, the face usually somewhat darker above on the lateral depressions. In profile the face is convexo-retreating, less so above; width of the face about three-fourths of a millimeter at the antennæ, increasing to slightly over one millimeter at the oral margin; front at its narrowest point distinctly narrower than the face at the antennæ, widening at the posterior angles of the eyes to about the same width as the face at the point mentioned, the sides of the front above very slightly concave, below the constriction gradually widening to the face. Antennæ reddish, brown apically; first segment a little shorter than the two following together; second segment less than half as long as the first; third segment pointed apically. Pile of the head pale yellowish. Eyes bare.

Thorax fuscous reddish, the pectus blackish. Dorsum with a broad longitudinal median blackish stripe, broadening posteriorly not reaching the scutellum; its posterior end diffuse rounded, and scarcely a third the width of the dorsum opposite the wings. Scutellum rather squarish, its apex parallel to its base, and a little over half the basal width, scarcely concave apically, the angles rounded. Pile of the thorax and scutellum pale yellowish, short, subappressed except on the scutellum.

Legs reddish, the femora more or less brownish except the ends and the base of the hind ones; hind tibiæ gradually somewhat enlarged; hind basitarsi longer than the remaining segments together, very much enlarged.

Wings luteous yellowish, the cross-veins tinged with brownish. Squamæ luteous whitish with a more luteous yellowish fringe. Halteres luteous yellowish.

Abdomen dull luteous reddish, the first two segments more piceous. First segment very short, shining; second segment in the middle, just half as long as the third, its disc plane, the lateral margins strongly convex, the sublateral depression extending outward from the anterior to the posterior angle, where the abdomen attains its greatest width; fourth segment as long

as the first three combined, on the apical third with two broadly separated arcuate depressions. Pile of the abdomen similar in color to that of the thorax, somewhat condensed on the posterior angles of the third and fourth segments and on the sides of the latter.

*Female.* Front as wide as the distance from the ocelli to the antennal base; scarcely differing in other respects.

Three specimens, all males: Ramsey, N. J., June 12, 1916; Keeney Alley, Essex county, New York, July 7, 1917 (H. Notman); De Grassi Point, Ontario, June 25, 1897 (E. M. Walker).

This species is readily distinguished from those forms of a similar color by the narrow face and front, position of the ocelli, and shape of the scutellum. I have not seen the female, so cannot decide upon the length of the segments, etc., but believe it is more like the male than in the *conflictus* group, which is characterized by the wider face, broader front, ocellar triangle near the posterior angle of the eyes, etc.

There has been considerable confusion regarding the identity of this species and members of the *conflictus* group, owing chiefly to carelessness, and for that reason it is not safe to say to which species references to *M. globosus* and *fuscipennis* apply. Williston's determination of *globosus* was the correct one, although his determination of *M. fuscipennis* Macq. was erroneous. Snow, in 1895, recognizing that *M. fuscipennis* did not possess spines on the scutellum, concluded that Williston had merely inverted the two species, placing the true *M. globosus* as *M. fuscipennis*. An examination of the arista and comparison with Macquart's description would have at once revealed the fact that there were even yet discrepancies which were too great to permit of Snow's specimens belonging to *fuscipennis* Macq. Macquart's diagnosis is unmistakable: "style renflé au milieu" leaves no room for doubt; and Walker's statement, "branch ferruginous, spindle-shaped," is also convincing, where the identity of *fuscipennis* is concerned. The only specimens to which the description of *fuscipennis* and *agapenor* applies are undoubtedly specimens in the Kansas University collection, determined by Williston and Snow as *pachystylum* Will., and other specimens in various collections. In this case the descriptions of both Walker and Macquart could not apply to any other species than what Williston described as *pachystylum*, and Williston doubted his identification of *fuscipennis*.

Because of the confusion which has resulted from Snow's action, it is impossible to determine which species is referred to by authors since that date, and for this reason I have omitted references since 1895. Aldrich followed Snow's synonymy in good faith, and unconsciously still further added to the resultant confusion.

### 20. *Microdon albipilis* n. sp.

(Plate V.)

Most closely allied to *M. marmoratus*, but the scutellar points are shorter and a little more widely separated (but not so widely as in *pseudoglobosis*), and the pile is wholly almost white; the third antennal segment is nearly twice as long as the first segment.

Length, 8.5 mm.; of wing, 6 mm.

*Male.* Face and front below the depression, piceous luteous; cheeks, occiput and upper portion of the front, blackish. Face in profile a little convex above,

receding convex below; the facial depressions on either side are moderate in size, together, at their greatest width, occupying about half the width of the face, below they gradually narrow, so that a little below the middle of the face they only narrowly border the eyes. Transverse groove of the front not curved, but extending straight between the angles of the eyes, which are only a little approximated. Width of the front about equal to the distance between the base of the antennæ and the posterior ocelli, which are situated on a line between the posterior angles of the eyes, and a little more remote from each other than from the anterior ocellus; the front is gently transversely convex on the middle line, and the areas of the depression below are finely punctate. Shining area above the antennæ triangular, its ends sharply rounded, its base a little longer. First two antennal segments luteous or reddish yellow; third blackish brown, dull; third segment about as long as the first two combined; second almost one-fourth the length of the first; the first segment would hardly reach to the anterior ocellus, and is not as long as the width of the front, while the third, by measurement, is as long as the greatest width of the face. Arista basal, bare, two-thirds as long as the third segment, a little longer than the first, reddish yellow. Pile of the head wholly whitish; in some lights appearing cinereous.

Thorax wholly piceous, shining where not thickly pilose; pile whitish. Scutellum piceous, without distinct grooves on the almost flat disc, the apical corners obtusely slightly produced, owing to the moderate emargination. Pile similar to that on the thorax.

Legs: Femora black, their apices reddish or pale yellowish; hind coxæ and trochanters piceous, the apex of the former and both ends of the latter, yellow, the ends of all the coxæ pale colored; tibiæ and tarsi reddish yellow, slender rings just before the middle of the anterior four tibiæ, broader postmedian ring on the hind ones, and the hind basitarsus, except the ends, piceous or brownish black; hind basitarsi greatly enlarged, its length about two-thirds that of the tibiæ and about equal to the length of the remaining tarsal segments combined, the inner end slightly produced, the inner side slightly concave, the outer wholly gently convex. Pile whitish except on the tarsal pads, where it is golden yellow.

Wings tinged with brownish yellow; almost hyaline posteriorly and posteroapically. Stigma yellow. All the cross-veins somewhat clouded; stump of vein short, a little oblique, situated decidedly before the middle of the discal cell; apical cross-vein almost straight, recurrent, so that it joins the third longitudinal vein just beyond the tip of the second. Squamæ almost white, with faintly yellow border and whitish fringe. Halteres pale yellow.

Abdomen ochre reddish brown, with obscure indefinite darker areas basally, laterally and medianly. The middle of the abdomen is slightly dented, so that the depressions are difficult to ascertain correctly. However, they are all shallow, the second segment being merely flattened, and the third continuing this character on the disc; lateral apical depression of the third and basal of the fourth segments almost wanting; apical V-shaped depression of the fourth almost obsolete, but there are one or two roundish or oval depressions present. Third segment twice as long as the second; fourth almost twice as long as the third. Pile on the usual areas, long, whitish, elsewhere short, rather cinereous.

Holotype, male, "Manitoba, Canada," in the Canadian National Collection, Ottawa.

## 21. *Microdon marmoratus* Bigot.

(Plate V.)

*Microdon marmoratus* Bigot, Annales, Soc. Ent. Fr., 1883, 320. Williston, Synopsis, 10.

Very similar to *conflictus* but distinguished by the absence of furrows on the scutellum, the disc of which is a little hollowed, the more approximate sutellar projections, and broader third antennal segment on the basal portion.

Length, 10 mm.

*Male*. Face and front dirty rusty reddish, the cheeks and occiput black, the triangle above the base of the antennæ and a narrow, elongate triangle projecting forwards in the middle from the ocellar triangle, polished blackish brown. In profile the face is a little convexoreceding, strongly so below; the lateral depressions occupy only about one-sixth the width of the face and are joined broadly with the roughened lower, lateral area of the front, so that the whole is granulated; on their lower end they do not extend broadly below the middle of the face. Front at the narrowest point distinctly broader than the distance between the base of the antennæ and the posterior ocellus, but hardly as broad as the distance between the former and the vertex. Eyes appearing angulated at the lower third of the front, where a slightly upwardly curved depression crosses it, but actually scarcely so; the front widens to the posterior angles of the eyes. Ocelli normally with the posterior ones a little remote, but in my example the right one is close to the anterior one. Pile of the head wholly brassy yellowish. Antennæ reddish, the apex of the first segment and the whole of the second somewhat darkened, the third black; third segment about equal in length to the basal two segments combined, broad basally, at three-fifths the distance from the base only half as wide, the end a little narrower and somewhat obtuse; first segment as long as the distance between its base and the posterior ocelli; the second segment short. Arista red, almost basal, stout, only three-fourths as long as the third segment.

Upper portion of the pleuræ, the scutellum and broad margins of the thorax colored like the face; pleuræ and pectus shining black. Disc of the dorsum darker than the margins. Pile brassy yellow, in some lights cinereous. Scutellum without transverse grooves, but with a shallow median depression. The sides of the scutellum are carried obliquely back to the ends of the "spines," between which the end is narrowly and moderately deeply concave.

Coxæ black, the hind ones more or less reddish; trochanters appearing partly reddish in some lights; femora black, their apical ends reddish; hind tibiæ with a ring beyond the middle, the disc of their basitarsi black. Hind basitarsi equal in length to the length of their remaining segments combined, slightly over half as long as the tibiæ, their inner side slightly concave, the outer a little convex, but the sides moderately parallel; basitarsi about twice as broad as the apex of the hind tibiæ.

Wings somewhat greyish, the cross-veins and stigma smoky; stump of vein short, not curved; apical cross-vein recurrent, almost straight, ending beyond the tip of the second vein. Squamæ pallidly yellowish, with yellow border and fringe. Halteres yellow.

Abdomen concolorous with the face; on the middle line, broadly on the basal segments, more or less illy defined, brownish. Second segment towards the sides a little depressed, so that the side margins, especially anteriorly, are raised, the disc of this segment elsewhere almost plane, continued onto the

base of the third segment. Lateral apical depression of the third segment practically obsolete, on the fourth only conspicuous at the lateral middle portion; the V-shaped depression on the fourth segment almost wanting, but one or two shallow depressions on either side. Third segment in the middle slightly over twice as long as the second, the fourth almost twice as long as the third.

One specimen; Mosier, Ore.; June 14 (F. R. Cole).

This species was originally described from California, and has been previously recorded from Oregon by Lovett.

## 22. *Microdon pseudoglobosus* n. sp.

(Plate V and IX.)

*Microdon fuscipennis* Williston, Synopsis, 4.

Very similar to *M. globosus*, but the front is fully twice as wide, the scutellum has distinct angles, the hind basitarsi are shorter and appear more enlarged. The angles of the scutellum are more widely separated than in *conflictus*, but seem to vary somewhat.

Length, 7.5 to 8.5 mm.

*Male*. Face and front ferruginous reddish, the former evenly convex below; face on the sides above with an orbital, roundish black depression, which leaves the middle convex; face and front almost evenly narrowed to the narrowest point of the front, which is distinguished by a deeply impressed arcuate transverse line, and thence slightly increased in width to the posterior angles of the eyes. Front more reddish or reddish yellow in color. Antennæ reddish, the third segment slightly longer than the first, somewhat curving upwards, its sides almost parallel, the end obtuse, a little more pointed above. Arista slender, uniformly tapering, shorter than the third segment. Head, except the eyes, with yellow pile.

Thorax ferruginous reddish, with a broad longitudinal median brown stripe which does not reach the apex, and a similarly colored stripe of about the same or greater width on either side, broadly separated from the anterior and posterior borders and interrupted at the suture. Pectus shining blackish. Pile of thorax yellowish, with some black hairs on the anterior half or more of the brown stripes. Scutellum ferruginous, almost piceous; on the anterior half with two or three deep impressions, which leave incomplete or broken oblique ridges, the posterior angle of which is a pit which extends almost to the posterior margin; posterior margin broadly concave, the angles not typically tuberculate, but sometimes with indications of a low, large tubercular swelling.

Legs shining piceous; the knees, apices of the tibiæ, anterior four tarsi and last four segments of the posterior tarsi, yellow or reddish; hind basitarsi less than twice as long as broad, about equal in length to their last four segments, in color slightly shining black or dark brown, with golden pubescence below. Pile of the legs not conspicuous, yellowish or tawny. The anterior four tibiæ may bear a narrow dark band.

Wings infuscated, lighter behind the third longitudinal vein; apical crossveins slightly recurrent, the vein closing the discal cell somewhat sinuous; the stump of vein into the first posterior cell extends almost at a right angle to the spurious vein, but may be slightly curved. Squamæ whitish, with a yellowish fringe. Halteres yellow.

Abdomen luteous reddish, the sides reddish. First segment polished reddish, shorter than the second; second segment flattened, the sides convex, not more than half as long as the third; the flattening of the second segment extends incompletely across the basal third of the third segment. Fourth segment slightly longer than the basal three combined, without distinctly impressed lines of pits. Pile of the abdomen short, yellow; on the sublateral portion of the second, basal two-thirds of the third and basal half of the fourth, with shorter, black pile, which is broadly separated from the lateral margins.

*Female.* Front slightly narrowed above, its lateral depressions broad, not extending clearly across below the middle, the median line rounded, raised; depressions moderately punctured. Pile wholly yellow. Facial side margins similar, broadly connected with the frontal depressions; pile on face below sometimes partly fulvous, elsewhere yellow.

Hind tarsi a little flattened, not or scarcely swollen.

Abdomen with shorter pile, arranged as in the female of *M. conflictus,* but whitish instead of bright brassy yellow; abdominal segments of same proportional lengths as in that species. The color varies from ferruginous reddish to ferruginous and may be more or less luteous in some specimens.

Holotype, male; Lucaston, N. J.; September 14, 1917 (E. Daecke); in the University of Kansas museum, bearing the label "*M. globosus.*"

Paratypes: Male, Aweme, Manitoba; August, 1920 (H. A. Robertson); in the Canadian national collection, Ottawa. Four males; Pennsylvania; in the Museum of the Bureau of Plant Industry, Harrisburg, Pa.; and the collection of the author. Male, Rutland, Va.; August 1, 1915; in R. C. Shannon's Collection.

Six females: Allotype, Da Costa, N. J.; July 16, 1901. Paratypes: Da Costa, N. J., July 1, 1905 (H. Wengel), July 16, 1901; Hammonton, N. J., September 16, 1903; Lucaston, N. J., September 9, 1906; Bamber, N. J., September 1, 1905. The holotype is in the museum of the Bureau of Plant Industry, Harrisburg, Pa. Paratypes are in the University of Kansas Museum and the collection of the author.

*M. pseudoglobsus* is very distinct from allied species, with the exception of *M. conflictus,* with which it might be confused in forms in which the scutellum is inclined to bear tuberculate swellings, which are well marked in two of my specimens. It is distinguished from *conflictus* by the more widely excavated scutellum, somewhat shorter scutellum, and the paler squamæ, which appears to be constant, etc.

The female is readily distinguished from *conflictus* by its smaller size, much paler wings, as they are brownish, not blackish or deep brown; the pile of the front is yellow, not golden; the abdominal pile is whitish, not brassy yellow; hind tarsal pads fulvous, not brick red; the front is less densely and coarsely punctured, the scutellar emargination is wider, etc.

### 23. *Microdon conflictus* n. sp.

(Plates V and IX.)

? *Microdon fuscipennis* (Macq.), Williston, Synopsis, 4.

Front not much narrowed; third antennal segment longer than the first; arista slender, not as long as the third segment; femora black, except apically; hind basitarsi much enlarged, black; scutellum long, subtriangular, its apex

rather deeply narrowly excavated; its dorsum usually with oblique depressions uniting in the middle line.

Length, 9 to 10 mm.

*Male*. Face and front ferruginous reddish, usually becoming black about the base of the antennæ; the former on each side above with a large depression which leaves the median part rather strongly convex; in profile rather strongly convexoreceding below, almost perpendicular above. Face and front gradually narrowed to just below the middle of the front, which is marked by a narrow depression which curves slightly forward, thence very slightly widened to the posterior angles of the eyes; the eyes do not form a distinct angle at the narrowest point. Posterior orbits black in the middle. Whole head, except the eyes, clothed with glistening yellow pile. Antennæ reddish yellow, the third segment brownish on the apical half, sometimes wholly so; first segment about four times as long as the second, slightly larger apically from some views, or often appearing narrower; third segment longer than the first, but not as long as the first two combined, broadest on the basal fourth, beyond which it curves slightly upwards to the tip, its lower apex broadly rounded, the upper sharply rounded; third segment clothed with short, abundant, yellow pubescence.

Thorax ferruginous reddish; pectus very shining black; in the middle of the dorsum with a broad, almost complete longitudinal brown stripe, which appears to be interrupted longitudinally because of conspicuous yellow pile; on either side a broad, dark, sometimes less distinct stripe, well separated from the ends of the thorax. Pile of the thorax shining yellowish; on the humeri cinerous; on the brown stripes fuscous. Scutellum large, its sides straight from the base to the tips of the very large tuberclelike projections which are formed by the rather narrow, deep apical emargination; on its disc with two or three conspicuous depressions placed obliquely, uniting on the middle line, the area between broad and convex; these depressions may not always be well marked and are perhaps sometimes absent. Scutellum ferruginous, its pile shorter and more erect than on the thorax.

Femora black or brown, their apices reddish; tibiæ and tarsi reddish, the hind tibiæ darker apically; hind basitarsi blackish above, the following segments becoming reddish apically. Hind tibiæ enlarged on their apical portion, their basitarsi greatly enlarged, with a cushion of red pubescence; the remaining tarsal segments normal. Pile of the legs reddish.

Wings moderately infuscated, paler posteriorly, a little darker on the cross-veins; apical cross-veins recurrent, the posterior one only slightly so. The stump of vein extends almost at a right angle slightly over half way across the first posterior cell. Squamæ whitish yellow, with yellow fringe. Halteres reddish, the knob yellow.

Abdomen ferruginous reddish; first segment shining brown, with an elongate, membranous-appearing area, which is narrowest inwardly, on each side; second segment more luteous reddish in color, except the convex sides, in the middle scarcely longer than the first segment, its disc almost flat, and only a little depressed inside the convex margins. Third segment narrowly more reddish posteriorly, more broadly so laterally and on the sides; about as long as the first two segments combined. Fourth segment chiefly lighter colored dorsomedianly, as long as the three basal segments combined; a rather con-

spicuous median basal depression and indications of a basal longitudinal impressed line. Pile of the abdomen chiefly shining yellowish; a roundish spot on the side of the second, the darker portion of the third, and a corresponding area on the fourth segments, with shorter, black pile.

*Female.* Face and front wide, the face slightly narrower at the lateral depressions, the front slightly narrowed above; frontal depression less distinct, the longitudinal convex line more raised; a more swollen ground about the antennal base; antennæ somewhat longer.

Median brown stripes of the thorax distinctly separated, the lateral stripes broader and very distinct; pile behind the suture reddish, on the darker stripes blackish or brown. Scutellum with a slightly broader concavity apically, the dorsal concavity deeper.

Legs similar in color; hind tibiæ and basitarsi only slightly enlarged.

Pattern of the wings similar, but the clouds brownish.

Abdomen much darker throughout, almost shining brown in one specimen. Fourth segment not quite twice as long as the third; fifth segment in its middle about as long as the fourth. Pile distributed as in the male.

Holotype, male; Great Falls, Va.; May 27.

Allotype, female; Rock Creek, D. C.; June 15. Determined as *globosus* by Williston? (This is probably the specimen which Snow had before him when he came to his decision regarding the disposal of the species. I think, therefore, that Williston had the specimen determined as *fuscipennis* Macq., but there is nothing to show this, except that Williston's determination was attached. I do not know whether Williston concurred in the change made by Snow, but both were here at that time. At any rate, it seems certain that the present species is that which Williston described as *fuscipennis* Macq., although the last species may also have been included.)

Paratype, female; Lawrence, Kan., June 18, 1922 (Curran).

The holotype and paratype are in the writer's collection, the allotype in the collection of the University of Kansas.

Paratype, male; Difficult Run, Virginia, Black Pond; September 13, 1916 (R. C. Shannon); in the collector's collection.

## 24. *Microdon coloradensis* Cockl. and Andr.

*Microdon coloradensis* Cockerell and Andrews, Proc. U. S. N. M., li, 53. Knab, Proc. Biol. Soc. Wash., xxx, 138.

Since the preparation of this paper I have examined the types of this species in the U. S. N. M. They are the same as *M. lanceolatum* Adams.

## 25. *Microdon megalogaster* Snow.

*Microdon megalogaster* Snow, Kans. Univ. Quart., i, 34. Johnson, Ent. News, xii, 95.
*Microdon bombiformis* Townsend, Trans. Am. Ent. Soc., xxii, 33. Knab, Proc. Biol. Soc. Wash., xxx, 137.

Abdomen wholly black pilose beyond the second abdominal segment; legs entirely blackish.

Length, 12 to 14 mm.

*Male.* Eyes bare. Face and front shining metallic greenish, the front sometimes blackish green; face broad below, slightly narrowing to above the middle, thence more strongly narrowed to the lower third of the front, which is

marked by an impression, above which the front is considerably widened to the posterior angles of the eyes. Face in profile almost straight on the upper third, thence almost evenly convexoretreating to the oral margin. A small, squarish, polished, narrowed above, bare spot above the base of the antennæ. Face on each side with an oval, impressed orbital area on the upper fourth. Pile of the head moderately long, straw yellow. Antennæ black; third segment sometimes shining brownish; first segment usually piceous or reddish except the apical portion; almost as long as the remaining two combined; second about one-fourth as long as the third; third segment with the sides almost parallel, slightly curved upwards apically, the end rounded below, subpointed above. Arista reddish, not as long as the third segment.

Thorax metallic greenish, with four or six obscure bluish stripes. Pile bright straw yellow, rather long. Scutellum metallic bluish, each angle broadly rounded, the apex a little excavated; there are very small tubercles, which might easily be overlooked in the dense pile. Pile straw yellow, sometimes more yellowish.

Legs black, with black pile, the tarsi appearing greyish yellow pollinose; broad, flattened. Hind tarsi with rusty reddish pubescence beneath.

Wings usually slightly brownish tinged, the cross-veins more or less clouded with luteous; last section of the fourth vein strongly recurrent, joining the third slightly before the tip of the second; last section of the fifth vein bulbous posteriorly, joining the fourth at a right angle. The first posterior cell is broadened beyond the junction of the fourth and fifth veins; the stump of vein into the first posterior cell is directed obliquely backwards and does not quite reach the spurious vein.

First and second abdominal segments metallic green, the remaining segments shining black, sometimes obscurely piceous apically and on the disc, the sides sometimes with a metallic greenish reflection. First segment short, about half as long as the second in the middle; second about half as long as the third; fourth three times as long as the third. Second segment usually with roundish depressions inside the basal angles; third with rather large latrobasal depressions, posteriorly on each side with a rather large depression which extends more extensively onto the fourth segment and may extend obliquely to the margin of the segment at the apical fourth; fourth segment with a roundish depression on each side of the apical third, from which there extends to the apical angles, more or less complete, moderately narrow depressions, in the form of a V when viewed from in front. Pile of the first and second segments yellowish, on the remaining segments black.

*Female*. Lateral facial depressions not so distinct, front only slightly narrowed. Fourth abdominal segment not quite twice as long as the third, considerably shorter in the middle. The demarkation of the fourth and fifth segments corresponds to the depressions on the fourth segment in the male. Fifth abdominal segment with sublateral depressions extending to the posterior angles. The inner side of the front tibiæ at the apex with distinct reddish or tawny pubescence, and the pubescence beneath all the tarsi more tawny.

This description is drawn from thirty specimens from Illinois, Virginia and Pennsylvania, including the type specimens of *megalogaster* Snow and *bombiformis* Townsend.

*M. megalogaster* is one of the most easily recognized species of the genus, and may be known from all the species I have studied by the wholly black

pilose abdomen beyond the second segment and the yellow pilose basal segments, together with the straw yellow pile of the head. *M. senilis* also has the abdomen entirely black pilose beyond the second segment, but the pile of the front and face is intermixed black and yellow, chiefly black across the lower part of the front.

Knab (*l. c.*) attempted to distinguish between *M. megalogaster* and *bombiformis* on the basis of the color of the patch of pile on the inner side of the anterior tibiæ basing his arguments only upon Snow's description. The color of this pile or pubescence is somewhat variable, as is demonstrated in the series before me, but there is, without question, only the one species, as is shown by an examination of the types. The type female, which is *bombiformis*, is very much larger than any other I have seen. Besides the locations given, the species has also been recorded from Massachusetts, Connecticut, New Jersey, District of Columbia, Virginia and Colorado. The type of the species is from Illinois, and not from Colorado as given in Aldrich's "Catalogue."

## 26. *Microdon senilis* Knab.

*Microdon senilis* Knab, Proc. Biol. Soc. Wash., xxx, 139.

"Face and front with black and yellow hairs, the black ones predominating on the middle of the front, the pale ones on the lower part of the face.

"Length, about 14 mm.; wing, 10.5 mm.

*Female*. Black, without metallic luster. Frons at the posterior angles of the eyes fully one-third the width of the head, broadening gradually and evenly to the face; transverse furrow obsolete, a narrow, smooth, elevated stripe medianly. Head vestiture of black and pale yellow hairs, the black ones predominating on the middle of the front, the pale ones on the lower half of the face, occiput and orbits. Antennæ black; first segment moderately long and slender; second segment less than half the length of the first, much enlarged distally; third joint stout, distinctly shorter than the first, thickened to the basal third and beyond tapered to a sharp point; arista coarse, black, about as long as the third segment. Mesonotum shining black, clothed throughout with short, coarse, black pile, densest towards the margins. Scutellum short and broad, the posterior margin irregularly rounded, unarmed; vestiture of dull ochreous yellow pile. Abdomen elongate ovate, flattened, much broader than the thorax, black, basally shining, beyond the base of the second segment rugose and clothed with very short black pile; a small patch of pale hairs at the posterior angles of the second segment. Venter wholly black. Legs black and black haired, the tibiæ with pale yellow hairs along the outer side; tarsi of all the legs ventrally with cushions of ferruginous pile. Pulvilli pale ferruginous; claws black. Wings broad, grayish hyaline; posterior angles of the first posterior and discal cells roundedly produced, the former with a stump projecting at the location of the angle. Halteres pale yellow.

"The close relationship of this species with *modestus* and *coloradensis* is obvious through both structural and coloration characters; however, differences exist which leave no doubt that these forms are specifically distinct." (Knab, *l. c.*)

This species will be distinguished from its allies by the bare or nonspinose scutellum, and the arrangement of the black pile on the face, abdomen and thorax. Its type locality is Claremont, Cal.

## 27. *Microdon manitobensis* n. sp.

(Plate III.)

Scutellum with small spines, usually with bright fulvous pile; legs black. Length, 11 to 13.5 mm.

*Male.* Eyes bare. Face and front shining black, with more or less greenish reflection. Face wider than one eye, the sides almost parallel; a not very conspicuous orbital depressed area on the upper fourth. Face in profile a little receding to below the middle, thence convexoreceding to the oral margin. Front considerably narrowed at the lower third, where there is a distinct transverse depression, thence increasing in width to the posterior angles of the eyes. Above the antennæ a squarish, polished area reaching to the transverse depressions. Posterior ocelli remote from each other. Head entirely straw yellow pilose. Antennæ black or brownish; the first segment usually reddish on about the basal half, almost as long as the two following together; second segment about one-third the length of the third; the third rounded apically, less so above.

Thorax aëneous blackish on the dorsum, with four or six obscure stripes with a coppery reflection. Pleuræ shining blackish green. Pile moderately long, pale straw yellow, sometimes more yellow, always somewhat brighter colored apically. Scutellum not emarginate apically, but bearing broadly separated small spines, usually concealed by the dense pile, which is usually bright fulvous, but sometimes only a little brighter colored than that of the thorax.

Legs black, with yellow pile; anterior tibiæ apically with yellow pubescence; the tarsal cushions more yellow.

Wings usually tinged with greyish or brownish, the veins clouded in mature specimens; last section of the fourth longitudinal vein recurrent, joining the third vein before the tip of the second; last section of the fifth vein a little bulbous, its end directed a little outward. The stump of vein into the first posterior cell runs posteroapically and is somewhat curved. Squamæ light yellowish, with pale fringe. Halteres yellow.

Abdomen black, densely punctured, the second segment and sides of the third with a brassy green reflection. Second segment with small depressions inside the basal angles; third with the base more or less depressed, more marked sublaterally, and usually the area inside the posterior angles is modified to connect with the elongate depressions on the side of the fourth segment; fourth segment with more or less distinct depressions forming a V on the apical third or more, when viewed from in front. Third segment over twice as long as the second; fourth two and one-half times as long as the third. Pile of the abdomen pale yellow; on the basal half of the third segment on each side, black; fourth segment with the base black pilose, emitting medianly a large triangular area almost to the apex of the segment, rarely reaching it, and an oblique, rather broad lobe on either side, not reaching the margin, but extending to the apical third. Venter with a brassy reflection, the apices of the segments reddish.

*Female.* Front slightly narrowed above, the shining area above the antennæ more triangular. Fourth abdominal segment in the middle about one and one-third times longer than the third, the fifth in the middle about as long as the fourth. The yellowish pile extends sparsely inwards along the hind margin and spreads somewhat forward on the lateral third of the fourth segment; on the fifth segment it extends forward in the middle to about one-third the distance to the anterior margin.

Described from thirty specimens of both sexes from Manitoba, Saskatche-

wan, British Columbia, Ontario, Quebec and Maine. Not rare about large ant hills. Several specimens were reared from pupæ collected in ant's nests at Teulon, Manitoba, by Dr. A. J. Hunter. The types are in the Canadian National Collection, Ottawa; Kansas University Museum; Bureau of Plant Industry, Harrisburg, Pa.; and the collections of C. B. D. Garrett, Dr. A. J. Hunter, and the author.

*M. manitobensis* has as its closest ally *M. xanthopilus*, but is readily distinguished from it by the tawny pile on the scutellum, paler colored abdominal pile and the distinct scutellar spines. It is distinguished from *M. megalogaster* by the presence of yellow pile beyond the second abdominal segment, but for a long time I have considered it to be a variation of this species.

## 28. *Microdon xanthopilus* Townsend.

*Microdon xanthopilus* Townsend, Proc. Cal. Acad. Sci., iv, 611.

Thorax with yellow pile; scutellum without spines, but with small tubercles; front black pilose across the middle; pile almost all bright brassy yellow.

Length, 12.5 mm.

*Male*. Eyes bare. Face and front green, with a brassy reflection; sides of the face almost parallel, slightly narrowed above. Front considerably narrowed at the lower third, which is marked laterally by impressed lines which curve obliquely to join a squarish polished bare area above the base of the antennæ; above, the front is considerably widened to the posterior angles of the eyes; posterior ocelli remote. Face on either side above with a moderate depression which extends narrowly down along the eyes. In profile the face is slightly convex, more so below. Pile of the head bright straw colored; black across the middle of the front. Antennæ brown; first segment about as long as the two following together; second segment dorsally about one-fourth the length of the third; third segment more pointed above apically, its upper margin practically straight, its lower slightly convex, more so apically. Arista almost as long as the third segment. Vertical triangle shining between the ocelli.

Thorax metallic greenish, with a slight brassy reflection, its dorsum finely punctured; lower part of the pleuræ and the pectus shining blackish green. Pile bright straw yellow, brighter posteriorly. Scutellum metallic greenish, with bright yellow pile, its end moderately excavated and with a tuberculate swelling on either side.

Legs brownish, the femora, except the ends, more blackish, the hind ones shining. Hind basitarsi slightly swollen.

Wings tinged with brownish; last section of the fourth vein recurrent, ending before the tip of the second longitudinal; last section of the fifth vein forming a bulbous loop, thence produced somewhat outwards apically. Squamæ whitish with pale yellowish fringe. Halteres yellow.

Abdomen piceous brownish, the second segment with metallic greenish reflections. Second segment, in the middle, slightly longer than the first; third segment twice as long as the second; fourth about three times as long as the third. Second segment with conspicuous depressions inside the basal angles and an elongate depression rising at the front border on each side of the middle and extending obliquely to the posterior margin at the outer fourth.

Third segment with depressions inside the anterior angles. Fourth segment with a depression inside the anterior angles and a less distinct one behind it extending back to the margin; on the apical third with a shallow depression on each side of the middle which extends obliquely back towards the posterior angles, but does not reach them. On the middle of the fourth segment a slightly impressed longitudinal line. Genitalia piceous reddish. Pile tawny yellow, rather brassy; on the third segment shorter black, except on the sides of the posterior margin, the black pile nowhere reaching the lateral margin; on the fourth segment black on the basal two-thirds, but the yellow extends inwardly basally, occupies the lateral margin, and extends rather broadly forward in the middle posteriorly.

Type specimen redescribed. It bears only the label "Cal."

Very close to *M. manitobensis*, but the general color is distinctive; it differs also in the color of the pile, arrangement of the abdominal pile, abdominal depressions, and the absence of true spines on the scutellum. It differs from *cothurnatus* in the color of the pile, the depressions, general color and venation.

## 29. *Microdon cothurnatus* Bigot.

(Plates IV and V.)

*Microdon cothurnatus* Bigot, Ann. Ent. Soc. Fr., 1883, 320. Knab, Proc. Biol. Soc. Wash., xxx, 134.

*Microdon tristis* var. *cothurnatus* (Bigot) Williston, Synopsis, 8. Aldrich, Cat., 346.

*Microdon tristis* subspecies, Cockerell and Andrews, Proc. U. S. N. M., li, 55.

*Microdon tristis* var. *cockerelli* (Cockerell and Andrews) Jones, Syrph. of Colo., 17.

First antennal segment almost as long as the two following together; posterior ocelli remote; scutellum with very small, rather remote spines or tubercles (wanting in var. *similis* Jones), the end of the scutellum scarcely concave. Abdomen with a brassy greenish or bronze reflection.

Length, 10 to 12 mm.

*Male*. Face and front metallic bronzed green, the former slightly convex above, more strongly so below; a little wider below; side depressions with short yellow pubescence or pollen, but the pile renders the depressions inconspicuous. Front moderately narrowed below, with a moderately deep transverse depression; above the antennæ a triangular, polished black area. Ocellar triangle not swollen, the posterior ocelli remote, the vertical bump rather broad, not much swollen, the upper surface roughened. Antennæ entirely black; third segment shorter than the first, moderately robust, somewhat curved upwards apically, the lower side gradually narrowed, the end almost evenly rounded. Arista black, shorter than the third segment, gradually tapering. In occasional specimens the basal portion of the first antennal segment may be somewhat reddish. Pile yellowish, a few black hairs across the frontal depression in some specimens.

Thorax bronze greenish, with two metallic watery bluish stripes and three or five bronze stripes. Pectus more blackish. Pile bright shining yellow. Scutellum metallic greenish, the end very slightly concave, at least above its lower margin, with small, or almost obsolete, well-separated spines. Pile concolorous with that of the thorax.

Legs black; tibiæ, except the middle, more or less luteous; the legs sometimes more extensively luteous or reddish. Pile rather conspicuous on the tibiæ, yellow. Tarsi with reddish pads.

Wings tinged with brownish or cinereous, more condensed on the cross-veins. Stump of vein situated about the middle of the first posterior cell, somewhat curved basally, directed obliquely outward. Apical cross-vein recurrent, almost straight, ending opposite the tip of the second vein. Squamæ very faintly yellowish.

Abdomen bronze black, the disc of the third segment somewhat greenish. First segment black. Second segment a little longer than the first, with a broad, transverse shallow basal depression and shallow depressions inside the basal angles. Third segment not quite twice as long as the second, rather flattened on the disc. Fourth segment about as long as the three basal segments combined, the lateral depressions not conspicuous, the apical V-shaped depression practically wanting. Pile brassy or golden yellow; third segment in the middle and basally, but well separated from the lateral margin, and the base of the fourth segment, with median and lateral projections, with shorter, black pile. On the hind margin of the third segment the yellow pile extends a little over one-third the distance across. The pile of the venter is all bright reddish yellow.

EASTERN FORM. *Male*. Differs from the typical form as follows: The face is metallic greenish black, piceous, or luteous reddish; pile paler, brassy. The front is never bronzed, except sometimes across the transverse suture. Base of the first antennal segment, sometimes the whole segment, together with the second segment, reddish or luteous; arista piceous or reddish.

Dorsum of the thorax more evenly bronzed, not showing distinct purplish or bluish stripes. Pile paler brassy. Scutellum usually less distinctly emarginate, but this difference is very slight.

The legs are paler, usually brownish, but the femora are usually reddish beneath and the tibiæ are all luteous or reddish, while the tarsi are more brownish.

Wings more fuscous, the stump of vein a little straighter.

Abdomen usually piceous or reddish on the broad margins, especially of the apical segments, and more or less wholly on the fourth segment. The dorsum is more metallic green, but the fourth segment may be more or less bronzed. The pile is very much paler and the light pile somewhat more extensive, as it usually extends almost entirely across the posterior border of the third segment and may broaden out somewhat towards the middle of the segment; it is also more extensive on the fourth segment, the projections of black pile being much narrower.

*Female*. Face with parallel sides, the front somewhat narrowed above; the color varies as in the male, the upper part of the front almost as pale as the face, the lower part usually more metallic green. Facial depressions and triangular frontal depressions metallic green, the transverse depression curved upwards laterally, indistinct in the middle. Polished area above the antennæ piceous or blackish.

The dorsum of the thorax usually shows two metallic bluish green stripes and additional steel blue areas posteriorly; sides more or less reddish.

The basal abdominal segments usually have a metallic steel blue reflection, but this may be more greenish. Fourth segment about one and one-half times as long as the third, the lateral depressions shallow. Fifth segment longer in the middle than the fourth, its apex truncate, the lateral depressions distinct.

Pile of the fourth segment similar in arrangement to that of the fourth segment of the male; fifth segment with a triangular basal median area black pilose.

TYPICAL FORMS. Two males, Pullman, Wash.

EASTERN FORM. Three specimens, Ontario; male, Guelph, Ont., June 23; male and female, Stowell, Manitoba; female, no data; male, New York; male, New Jersey; two males, Pennsylvania.

### 29*a*. *M. cothurnatus* var. *similis* Jones.

*Microdon similis* Jones, Ann. Ent. Soc. Am., x, 219; Syrph. Colo., 17.

Differs from the typical form in that there is absolutely no trace of spines or tubercles on the scutellum, but there is a slight trace of emargination on the middle of the apex, but it does not reach to the lower margin. A specimen from Pennsylvania agrees perfectly with Jones' description. I can see no character which would justify the status of a distinct species for this form, and some specimens, including one from Pennsylvania, might better belong here than with the typical form, as the spines are represented by extremely small tubercles.

*M. cothurnatus* was not clearly distinguished until the publication of Knab's paper in 1917, when he treated the species allied to *tristis*, basing his conclusions upon specimens in the National Museum and in the collection of V. A. E. Daecke. While several of the specimens which Knab had before him have been examined, no representatives of *cothurnatus* have been seen bearing his determination label. When Williston prepared the synopsis he was inclined to group the species, and *cothurnatus* was placed as a variety of *tristis*. All those variations mentioned by Williston in his "Synopsis" have since been recognized as distinct species. There is much variation in the present species and two distinct forms are recognized—the western form, of a darker color throughout; and the eastern form, which extends into the Rockies, rather pale in general color. However, there are numerous intermediate forms. One variety is recognized, *M. similis* Jones, originally described from Colorado, but apparently occurring wherever the typical forms occur. There are too many intermediate forms to permit of the distinction of this variation as specific.

### 30. *Microdon modestus* Knab.

*Microdon modestus* Knab, Proc. Biol. Soc. Wash., xxx, 139.

"Piceous black without metallic luster; face clothed with black hairs, some pale ones at the lower margin; mesonotum with yellowish pile.

"Length, 11 to 13 mm.; wing, 8.5 to 10 mm.

"*Male*. Frons broad, narrowing slightly and regularly to the posterior angles of the eyes, where it is distinctly more than one-third the width of the head; transverse furrow arcuate, indistinct, an elongate polished bare spot over the insertion of the antennæ; vestiture of the frons of black hairs, with dirty yellow ones intermixed, particularly posteriorly and at the sides. Face clothed with black hairs, some pale ones at the lower margin. Antennæ black; first segment long and slender, about equaling the longitudinal diameter of the head; second segment slightly more than half as long as first, much enlarged distally; third segment hardly as long as the first, much thickened on the basal third and beyond tapering to a sharp point; arista a coarse piceous bristle, about equal in length to the third segment. Mesonotum piceous black, rather shining, clothed with dull yellow hair, rather sparse on the disc

and becoming dense towards the margins. Scutellum broadly rounded posteriorly, unarmed, concolorous with mesonotum and densely clothed with long, dull yellow pile. Abdomen elongate ovate, flattened, much broader than the thorax, broadest at third segment; color black, clothed dorsally with short but rather dense black pile, the posterior margin of the second segment narrowly yellow haired and ending in patches of such hairs at the posterior angles; third segment with similar patches of yellow hair at posterior angles; fourth segment with a series of coarse, pale setæ at posterior margin. Genitalia piceous brown. Venter with scattered long pale hairs. Legs black, and clothed mostly with short black pile; the tarsi ventrally with slightly paler hairs, on their hind legs the first two segments ventrally with a cushion of dull ferruginous pile; pulvilli dull ferruginous; claws black. Wings short, moderately broad, greyish hyaline, unspotted; posterior angles of the first posterior and discal cells roundedly produced, in both with the vein section closing the cell sinuate and bearing a very short spur projecting inward. Halteres ferruginous yellow. Tegulæ pale yellowish.

"*Female*. Frons similar to the male, still broader, the transverse furrow obsolete; vestiture of frons and face almost wholly black. Mesonotum clothed wholly with black hairs. Scutellum mostly black haired, a few whitish hairs intermixed. Abdomen wholly black, only the cushions of the tarsi indistinctly paler.

"The type male has the hairs of the mesonotum and scutellum deep brownish yellow, while in the paratype male this pubescence is a very pale dirty yellow." (Knab, *l. c.*)

Described from three specimens from Elko, Nev.

### 31. *Microdon ruficrus* Williston.

(Plates III and V.)

*Microdon tristis* var. *ruficrus* Williston, Synopsis, 7.
*Microdon ruficrus* Knab, Proc. Biol. Soc. Wash., xxx, 135.

Eyes bare. Front of male broadened posteriorly, vertical bump almost absent, but more conspicuous in the female; third antennal segment with nearly parallel sides; scutellar spines pilose and situated at the sides of a rather deep concavity; stump of vein about the middle of the first posterior cell.

Length, 8 to 11 mm.

*Male*. Face and front metallic greenish, although the face may be more or less piceous or even reddish, with a greenish reflection. In profile the face is almost evenly convex, a little more retreating below. Lateral depression not conspicuous, very narrow, and marked by a concentration of the thin brassy yellow pile which elsewhere covers the face; a little broader below. Front considerably constricted below, with a rather deep but broad transverse depression; the width at the posterior angles of the eyes is about equal to the width of the face immediately below the antennæ. A polished subtriangular bronzed area just above the antennæ. Posterior ocelli remote, the ocellar swelling extending to the vertex, but not forming a conspicuous bump. Pile of the front similar to that of the face, but a narrow black pilose band in front of the ocelli. Occiput metallic greenish, along the eyes rather densely yellowish pilose. Antennæ reddish, luteous or piceous, the third segment more brownish, dull. Third segment not as long as the first, rather robust, its sides almost parallel, curving up slightly, its end obtusely rounded, more rectangular above. Arista yellowish, slender, about equal in length to the third segment.

Thorax metallic greenish, the sides of the dorsum more or less piceous; with

four more or less bronzed stripes, their margins appearing brassy. Pectus blackish. Pile of the thorax somewhat recumbent on the dorsum, rather brassy yellow, more or less rusty on the disc, sparse on the pleuræ. Scutellum more piceous, with a metallic green reflection in some lights, its end rather deeply concave and bearing at each side of the concavity a stout, long pilose spine. Pile of the scutellum yellowish.

Legs piceous, the tibiæ and tarsi usually reddish or luteous, but the former sometimes with a brownish band, or the color of the legs may be more blackish. Pile brassy yellow, not obscuring the ground color. Tarsi normal.

Wings tinged with luteous, the stigma, costal and subcostal cells slightly yellow. The stump of vein is situated about the middle of the first posterior cell and is usually short, straight and directed outwards. Apical cross-vein recurrent, ending before the tip of the second longitudinal vein. Squamæ tinged with yellow, with pale yellow border and fringe. Halteres yellow.

Abdomen bluish, metallic greenish or more or less piceous with a metallic greenish or bluish reflection; first segment polished black or brown. Second segment twice as long as the first, shallowy depressed basally, basolaterally with a moderately deep depression, which leaves the side margin strongly convex. Third segment not much longer than the second, with shallow depressions inside the basal angles; inside the posterior angles with shallow depressions joining the lateral depressions of the fourth segment. Fourth segment twice as long as the third, its sides not much shorter than its median length; lateral depressions shallow and disconnected, while the V-shaped depression on the apical portion is almost wanting, although sometimes present. Pile of the abdomen whitish, sparse; on the third segment, except the margins and an arch on the base of the fourth segment, black pilose. The white pile on the apex of the third segment forms a narrow, complete or narrowly interrupted band, and this character is distinctive.

*Female.* Front very slightly narrowed above; facial depressions distinct, greyish pollinose, extending narrowly up and down along the eyes. Frontal transverse depression broad, not deep; an oblique line runs from above the antennæ to the facial depression; polished area above the antennæ triangular, rather long. Vertical bump larger, more granular, almost connected with the ocellar triangle.

Stump of vein beyond the middle of the first posterior cell. Squamæ paler, almost white.

Fourth abdominal segment scarcely longer than the third; fifth segment longer than the fourth, with well-marked depressions inside the anterior angles. Pile more extensively pale, and pale hairs are found on the anterior half of the fourth segment, intermixed with black.

Two specimens; Brownshill Junction, N. J.; June 22 and July 5, 1907 (Daecke). These were among the specimens studied by Knab when he revised this group.

*M. ruficrus* was long considered a variety of *M. tristis*, but it was established beyond doubt by Knab that it should rank as a distinct species. It is especially distinguished by the complete or almost complete yellowish pilose band on the third abdominal segment and the pilose spines of the scutellum.

## 32. *Microdon lanceolatus* Adams.

(Plate V.)

*Microdon lanceolatus* Adams, Kans. Univ. Sci. Bull., ii, 222.

Third antennal segment short, lanceolate; scutellum unarmed, evenly rounded apically.

Length, 12 mm.

*Male.* Face and front greenish black, the sides nearly parallel, face slightly broader below. In profile the face is elevated immediately below the antennæ, thence gently convex, more strongly so below. Lateral depressions shallow and not well marked, broad above, distinctly extending along the eyes to join the pits separating the jowls from the anterior portion of the cheeks; below the eyes the occiput prominent, convex. Laterally the transverse groove rises opposite the anterior ocellus, while in the middle it is half way between the ocellus and antennal base. The polished area above the antennæ seems to bear a median longitudinal groove. Occiput swollen, the hairs behind the eyes directed forwards. Pile of the head brassy yellowish. Posterior ocelli remote. Antennæ black; third segment more brownish; first segment almost as long as the two following combined; second segment over twice as broad apically as basally; third segment stout basally, lanceolate, about twice the length of the second; about its middle on the inner side with what appears to be a sensory pit. Arista blackish, about equal in length to the third segment.

Thorax bronze black; pectus and pleuræ shining black, the mesopleuræ somewhat piceous. Scutellum evenly rounded apically, unarmed. Pile of thorax and scutellum brassy yellow.

Legs shining black, with black or brown pile; the middle, and possibly the front tibiæ, with brassy yellowish pile; the hairs inside the anterior four tibiæ apically, and the tarsal pads, rusty reddish. Tarsi flattened, but not enlarged.

Wings hyaline in the type specimen, but possibly the veins are fringed with luteous or fuscous in normal specimens, as the type does not seem to be quite fully pigmented. Stump of vein long, straight, directed obliquely outward, rising about the middle of the first posterior cell. Last section of the fourth vein, after the curve, almost straight, recurrent. Squamæ pallidly yellowish, with yellow fringe. Halteres yellow.

Abdomen shining brownish or piceous black (in this type it is somewhat out of shape, so that it is not possible to judge absolutely correctly of the depressions, especially on the third segment). On each side of the median longitudinal raised portion of the second segment is a depression which curves outwards posteriorly and runs to inside the convex lateral margins, leaving the apex of the segment raised; there are deep, but not extensive depressions inside the anterior angles; further than this the depressions seem to be as usual. Pile chiefly brassy yellow; disc of the third segment with black or brown pile, which forms a semicircle, the flat side resting on the base of the segment, reaching laterally as far as the convex margin and extending to the apex of the segment at just the very middle; on the fourth segment the pile is all brown and black except on the sides posteriorly and on the apex. Hypopygium piceous or reddish, with short reddish pubescence.

Redescribed from the type; Clark county, Kansas; May; 1912 feet (F. H. Snow). The type is in the Kansas University Museum.

The shape of the antennæ is distinctive. The third antennal segment of *M. modestus* is somewhat similar, but it is more elongate, and the pile of the face and front is largely black.

### 33. *Microdon champlaini* n. sp.

(Plate IV.)

Eyes bare. Third antennal segment shorter than the first; vertical bump very small, the frons more shining than in *tristis*, black pilose above and below; scutellar spines very widely separated, not pilose, the scutellum shallowly, widely excavated.

Length, 9 to 11.5 mm.

*Male*. Face and front greenish black, with a slight bronze or bluish reflection, not steel blue, as in *piperi*. Facial depressions obsolete, but there is some greyish pollen in their place. Face convex, more receding on the lower half; pile whitish yellow, somewhat cinereous above. Face widest below; front considerably narrowed; transverse depression rather deep, narrow, polished. The polished area above the antennæ reaches broadly to the transverse suture and has a peculiar roughening or swelling near its upper end. Posterior ocelli a little remote, their triangle large. Vertical bump usually very small and not more densely punctured than the front; front finely punctured and shining. Pile black in front of the transverse depression and before the ocellar triangle; colored like that of the face, narrowly across the depression and above. Occiput greenish or bluish black, with pale pile. Antennæ black; first segment more or less reddish basally, not as long as the two following segments combined; third segment not quite as long as the first, broadest subbasally and gradually tapering to the rather blunt tip. Arista slender, reddish yellow, shorter than the third segment.

Thorax metallic greenish or bluish black, the disc chiefly bronzed, with three more or less distinct broad cupreous stripes which are somewhat fused posteriorly. Pleuræ below, and the pectus, very shining, blackish. Pile of the thorax and scutellum pale brassy yellow, but always reddish or fulvous just on the disc. Scutellum transverse, the end slightly excavated, more so in the immediate middle, bearing on each side of the excavation a moderately sized spine which is not pilose; the spine is actually situated upon a small tubercle which varies somewhat in size, and which bears short pile in most cases.

Femora black; tibiæ and tarsi brown, the latter becoming pale apically; pile of the tibiæ pallid, somewhat obscuring the ground color, beneath the tarsi and inside the front tibiæ, more golden. Legs simple.

Wings somewhat cinereous or brownish, the color more condensed on the cross-veins. The stump of vein arises about the middle of the first posterior cell, is short and directed a little outwards, the spurious vein ending just behind its tip. Apical cross-vein almost straight from just after the bulb, ending opposite the tip of the second vein. Squamæ almost white, with white fringe. Halteres pale yellow.

Abdomen dull black, the sides and apex more or less obscure luteous. First segment polished black; second with more or less metallic greenish or bluish reflection; its sides with a deep, broad depression which leaves the margins strongly convex, especially in front. Third segment about one and one-half times as long as the second, slightly transversely depressed basally on either

side, with or without a shallow depression inside the posterior angles. Fourth segment about as long as the first three combined, the lateral depressions shallow, the apical V-shaped depression more distinct basally, its arms becoming obsolete. Pile whitish yellow; on the third segment except the sides and a narrow, broadly interrupted posterior margin, and the base of the fourth, slightly broadened laterally and produced as a triangle in the middle, short black pilose.

*Female*. Front scarcely narrowed above; face slightly wider below. Sides of the face just below the antennæ very slightly depressed, the usual facial depressions almost obsolete, but the pollen nearly twice as wide as in the male. Front without distinct transverse groove, but more densely punctured on the lateral triangles just below its usual location; a distinct line runs from just above the antennæ to the facial depressions.

Cupreous stripes of the thorax narrower and more distinct; the pile on the disc, while darker than elsewhere, is bright yellow instead of reddish.

Scutellum slightly concave, the spines situated upon somewhat more conical swellings which are usually more pilose, but the spines themselves quite bare.

Fourth abdominal segment about one and one-half times as long as the third, the lateral depressions shallow; fifth segment a little longer than the fourth, its end truncate; lateral depressions not usually deep. Pile of the fourth segment as on the third, but the pale pile a little more extensive inside the posterior angles. The black pile on the fifth segment is limited to a broad, incomplete basal band emitting a median triangular area.

Holotype, male; Linglestown, Pa.; June 14, 1920 (J. N. Knull). Allotype, female; same data (A. B. Champlain); in the Bureau of Plant Industry, Harrisburg, Pa.

Paratypes: Male, Mt. Holly, Pa., June 14, 1921; male, Charter Oak, Pa., June 1920 (both Knull). Female, Linglestown, Pa., June 14, 1920; and female, Harrisburg, Pa. (both Champlain). Female, Mt. Holly, Pa., June 14, 1921 (Champlain and Knull). Male, Ramsey, N. J., June 16, 1916; Odenton, Maryland, July 18 (R. C. Shannon).

This species is very like *M. ruficrus* but the vertical bump is smaller, the spines of the scutellum shorter and never themselves pilose, the antennæ longer, etc. From *tristis* which it resembles closely the black pile of the front will distinguish it; also, the vertical bump is smaller, the antennæ shorter, the spines of the scutellum usually slightly smaller.

## 34. *Microdon tristis* Loew.

(Plates III and V.)

*Microdon tristis* Loew, Cent. v, 45. Williston, Synopsis, 6. Johnson, Psyche, xxiii, No. 3, 75. Knab, Proc. Biol. Soc. Wash., xxx, 135.

Third antennal segment a little longer than the first; face rather flat; scutellar spines at the corners of a moderate concavity, moderate in size and not pilose; stump of vein at or slightly beyond the middle of the first posterior cell in the male, before the middle in the female.

Length, 10 to 13 mm.

*Male*. Face and front bronze black, the former unusually flat, broadened below, not convex above, but convex-retreating below; somewhat laterally convex on the sides. Facial depressions narrow, grey pollinose. Pile pale brassy yel-

low. Subtriangular polished area above the antennæ shining steel blue. Transverse depression deep and narrow. Front moderately constricted below. Posterior ocelli remote; ocellar triangle long, extending quite to the transverse depression, and connected with the vertical bump which is usually rather large, transversely granulate-rugose, with a greenish reflection. Pile similar to that on the face. Occiput greenish black, with pallid pile, more condensed along the eyes. Antennæ black, the first segment more or less reddish basally; third segment longer than the first, widest at the basal third, beyond which it curves slightly upwards and is slightly narrowed so that it ends in a moderately narrow blunt tip, the upper margin not at all forming part of the narrowing.

Thorax bronzed or purplish, with four to six longitudinal greenish stripes, sometimes not at all distinct. Pectus more blackish. Pile brassy yellowish. Scutellum purplish bronzed, somewhat concave and bearing at either side of the concavity a stout spur which is not pilose. On the dorsum there are two or three transverse grooves, more or less obsolete at times.

Legs blackish; the coxæ more or less, the trochanters and bases of the femora, luteous or reddish. Tibiæ usually more or less reddish or luteous basally and apically and the tarsi similar in color, but very variable. In one specimen the legs are entirely reddish, in another all luteous beyond the femora. Pile chiefly whitish yellow, but more golden under the tarsi and inside the anterior tibiæ apically.

Wings lightly infuscated, more condensed along the veins. Apical cross-vein recurrent and joining the third longitudinal vein before the tip of the second. Stump of vein at or slightly beyond the middle of the first posterior cell. Squamæ tinged with yellow, the border and fringe of the same color. Halteres pale yellow.

Abdomen usually rather dull black with the sides and apex piceous, reddish or luteous, but sometimes the lighter color prevails. It is very densely and coarsely punctured except along the margin and apex. Second segment usually with a greenish reflection; with a very shallow depression inside the anterior angles. Third segment almost one and three-fourths times as long as the second, very slightly depressed basally and inside the posterior angles. Fourth segment longer than the first three combined, usually with well-marked lateral depressions; less densely punctured laterally and apically, with the tip polished reddish. Pile brassy yellow on the first two segments, the lateral margins, posterior margin of the third segment laterally and rather broad areas stretching forward on the posterior two-thirds of the fourth segment. Elsewhere the pile is shorter, black. The light-colored pile may sometimes extend entirely across the posterior margin of the fourth segment. V-shaped depression of the fourth segment usually very indistinct or entirely wanting.

*Female*. Face about equal in width throughout, the front a little narrowed. Facial side depressions wider, joined to the broader, more triangular, very densely punctured depressions on either side of the lower half of the front, these latter replacing the usual transverse depression of the male. Polished area above the antennæ larger; vertical bump a little larger. The pile of the front in one specimen is tipped with cinereous.

Pile of the thorax and scutellum more yellow-brassy. Stump of vein situated slightly before the middle of the first posterior cell.

Pile of the sides of the abdomen rather golden brassy. Fourth and fifth segments of about equal length. Pile on the base of the fourth segment black,

emitting a broad median and narrow lateral black pilose areas; fifth segment with similar black pilose areas.

Described from 32 specimens from Ontario, Manitoba, Quebec, New York, New Jersey and Pennsylvania. In addition the species has been reported from Colorado, Wisconsin, Ohio, Maine, New Brunswick and Nova Scotia. Some of these determinations must be regarded as doubtful, although the range probably extends as far west as the Rockies.

Readily distinguished from *champlaini* by the absence of black pile across the front, and fulvous pile on the disc of the thorax.

### 35. *Microdon cutristis* n. sp.

(Plate IV.)

Polished area above the antennæ not reaching the suture; width of the front less than the distance from the base of the antennæ to the ocelli. Pile chiefly bright yellowish; wings brownish.

Length, 12 mm.

*Male*. Eyes bare. Face and front shining blackish, with a brassy reflection; face wider than the width of one eye; sides parallel to the upper sixth, thence strongly constricted to the lower third of the front, above which it widens to the posterior angles of the eyes, but not as wide above as the face. Face without impressions on the sides above. Transverse frontal depression well marked; ocellar triangle small, the ocelli equidistant. Pile of the head wholly bright yellowish, moderately long. First antennal segment brownish, the last two segments missing.

Thorax metallic greenish, with bluish reflection in some lights; tip of the humeri and sides of the dorsum behind the wings, reddish. Dorsum with four narrow cupreous stripes. Pile of thorax moderately long, bright yellow. Scutellum reddish, its base greenish, the whole with a greenish brassy reflection in some lights; apex rather broadly but shallowly concave and bearing on each side a moderately well developed reddish spine, which is not pilose. Pile of the scutellum bright yellow.

Legs reddish yellow, the tarsi more reddish; femora, except the apices, black, their bases paler; pile yellow. Hind tibiæ not swollen, their basitarsi scarcely so.

Wings somewhat brownish, paler distally and posteriorly. Fourth longitudinal vein, on its last section, recurrent and ending slightly before the tip of the second vein.

Abdomen shining, densely punctured. Second segment and posterior margin of the third, metallic greenish; sides of the third and fourth segments and end of the fourth, reddish. Second segment almost plane on its disc, the sides convex. Fourth segment strongly depressed basally at the sides, the depression extending to the posterior angles; a triangular area on the apex of the fourth segment less thickly punctured and limited by obscure depressions. Third segment slightly over twice as long as the second, the fourth slightly longer than the basal three combined. Pile of the abdomen bright yellow; the third segment except the sides and apex, the base of the fourth segment, emitting a median oval area, and large, sublateral areas, with shorter black pile. Hypopygium reddish, with yellow pile.

Holotype, male; Yucatan, Mexico (G. F. Gaumer); in the University of Kansas Museum, determined as *tristis* by Williston.

### 36. *Microdon scutifer* Knab.

*Microdon scutifer* Knab, Proc. Biol. Soc. Wash., xxx, 141.

Length, 9 mm.; wings, 7 mm.

*Female*. Moderately stout. Head black. Frons over one-third the width of the head, the eye margins parallel to level of the antennæ; surface rather densely covered with setigerous punctures except about ocelli and above antennæ; pile short, black on occiput, white in front of the obsolescent transverse furrow. Face moderately convex, narrowing slightly towards the mouth; pubescence black in the middle, broadly yellowish white on the sides and beneath. Proboscis bright ferruginous. Antennæ blackish, stout, moderately long, the first and third segments subequal; third segment ochreous at the base, moderately stout, nearly uniform throughout, bluntly rounded at the apex; arista very stout, much shorter than the third segment. Mesonotum bronzy black on the disc, the humeri, lateral and posterior margins broadly, light ochre yellow, posteriorly forming two wedge-shaped indentations into the dark color and slighter ones at the transverse suture; vestiture very short and blackish on the disc, yellow white and longer on the yellow portions. Scutellum light ocher yellow, moderately prominent, inflated, with two rather closely approximated but distinct and stout spines; vestiture rather sparse, inconspicuous, yellowish grey, that on the spines whitish. Pleuræ ocher yellow, spotted with brown, the sternopleuræ dark brown and with a patch of bright golden hair. Abdomen elongate, broader than the thorax, broadest at the apex of the second segment, tapered very gradually to the apex of the fourth, the fifth segment tapered to a blunt point and having the form of a nearly equilateral triangle; color dorsally ocher yellow and blackish brown, the dark color broad on the middle of the first segment and base of second, continued over the third segment in a narrow median stripe, on the fourth and fifth segments spreading out over most of the surface, leaving only the angles broadly ochreous; vestiture of short yellowish white hairs, anteriorly confined to the margins, on the third and fourth segments tending to form interrupted posterior bands, on the fifth covering nearly the entire segment; venter ocher yellow, spotted with piceous. Legs stout, piceous black, including the coxæ, the knees narrowly ferruginous; tibiæ densely clothed with appressed pile with yellowish white silky luster; tarsi ventrally with bright ferruginous cushions; pulvilli dull ferruginous; claws large and black. Wings broad, tinted with smoky grey, the veins brown; posterior angles of the first posterior and discal cells roundedly produced, the former with distinct appendices, the latter with mere trace of a stump; middle of first posterior cell with the usual spur from the third vein. Halteres pale yellow.

"This species is closely related to *M. falcatus* Williston, from the Isthmus of Tehuantepec. It differs in the much larger size, wholly black head, very different proportion of the antennal segments, as well as in many minor details. In *falcatus* the third antennal segment is nearly twice as long as the first, the scutellar spines are obsolete and the body vestiture is black." (Knab, *l. c.*)

Texas is the type locality.

### 37. *Microdon diversipilosus* n. sp.

(Plate IV.)

Sides of face parallel, front moderately narrowed and not one-third the width of the head; scutellum with rather approximated pilose spines.

Length, 10 mm.

*Male.* Eyes bare. Face and front shining greenish black. Face not one-third the width of the head, its sides parallel; front moderately narrowed at the lower third, with transverse groove; above the constriction, considerably broadened, so that its width at the vertex is greater than the width of the face. Face very slightly convex above, on the lower half convex-receding to the oral opening. Front with a polished black swelling above the antennæ; distance from the base of the antennæ to the ocelli greater than the least width of the front. Ocelli approximate. Vertex limited on each side behind the eyes at their angles by an inwardly directed oblique ridge. Pile of the head straw yellow, brown on the sides of the front at the middle. Antennæ with the first two segments reddish, the third missing.

Thorax shining blackish green, the disc with strong coppery reflections; pleuræ in the middle, especially posteriorly, piceous or reddish. Pile short, yellowish. Scutellum subtriangular, its apex narrowly concave, on each side of the concavity with a rather stout, moderately long, pilose spine. Pile of the scutellum yellowish.

Legs reddish; basal half of the femora shining black; all the femora stout. Hind basitarsi and tibiæ only slightly thickened. Pile of the legs wholly short yellow.

Wings brownish along the veins; stigma luteous. Last section of the fourth vein recurrent, joining the third before the tip of the second vein; last section of the fifth vein recurrent, but joining the fourth at almost a right angle. There are stumps of veins at the posterior angles of the first posterior and discal cells. The stump of vein in the first posterior cell is directed very slightly toward the tip of the wing, reaching about half way across the cell. Squamæ pallidly yellowish with yellowish fringe. Halteres yellow.

Abdomen piceous; a median line, the lateral margins and apical portions with a bluish reflection in some lights. Second segment with a rather large, roundish, luteous area on each side of the median line. Pile brassy yellow and subappressed, except a small area of brown pile inside the apical angles of the second segment. When viewed dorsolaterally the hind margin of the third segment and all but a broad oblique area extending forward on the fourth segment appears brassy yellow, owing to the arrangement of the pile; only from a front view does the abdomen appear wholly yellow pilose. First segment short; second slightly over half as long as the third in the middle; fourth about as long as the basal three segments combined. The second segment is a little flattened before the sides, but the abdomen does not display conspicuous depressions.

Holotype, male; Clark county, Kansas, June; 1962 feet (F. H. Snow); in the University of Kansas Museum.

## 38. *Microdon fuscipennis* Macquart.

(Plate V.)

*Ceratophya fuscipennis* Macq., Hist. Nat. Dipt., i, 488.
*Microdon agapenor* Walker, List, iii, 539.
*Mesophila fuscipennis* (Macq.) Walker, List, iv, 1157.
*Microdon pachystylum* Williston, Synopsis, 8.

Distinguished from all other species from north of Mexico by the very long third antennal segment and the short, spear-head shaped arista.

Length, 8 to 10 mm.

*Male.* Face shining greenish black, slightly convex, convex-retreating below; above, on each side with an oblique rather broad depression, which is very marked on the lower inner portion, leaving the middle of the face decidedly raised, the depression not sharply defined above. Front narrowest at the vertex, gradually increasing in width; in the middle with a biarcuate depression separating the lower two-fifths from the upper part. The ground color is red above the depression, black below it. Pile of the head pale yellow. Eyes bare. First two antennal segments yellowish red, the third brown, obscurely reddish basally; third segment over twice as long as the first two combined, the first two equal in length to the distance between the base of the antennæ and the ocelli; third segment slightly enlarged basally, the sides almost parallel, the end subtruncate; arista about equal in length to the first antennal segment, flattened, spear-head shaped.

Thorax slightly shining greenish black, the pectus black, very shining. Scutellum concolorous with the dorsum, its end rounded. Thorax and scutellum with pale yellowish pile.

Femora black; coxæ more or less reddish. Apices of the femora and remainder of the legs reddish; hind basitarsi slightly swollen.

Wings somewhat luteous, the stigma pale luteous. Apical and discal crossveins recurrent, the stump of vein projecting into the first posterior cell directed towards the apex of the wing. Squamæ whitish yellow with short white fringe. Halteres orange yellow.

Abdomen chiefly brownish; disc of the second segment, disc of the third more broadly posteriorly, and usually the fourth segment more or less extensively anteriorly, reddish or yellowish, but very variable, so that most of the abdomen may be brownish, with paler markings only on the second and third segments. First abdominal segment as long as, or almost as long as, the second, in the middle with a very shining, slightly concave shield-shaped area covering the whole of the middle, on the sides with a membranelike area, narrow and pointed inwardly, limiting the shining area. Second segment half as long as the third, shining at the base, with a basal depression joining the lateral depression, which is rather broad and does not leave the side margins as convex as in *globosus*. Third segment with a small basal depression on either side of the middle. Fourth segment about equal in length to the second and third combined; on the anterior angles with a depression which is sharply limited interoapically and a subapical depression on either side. Pile of the abdomen short, yellowish.

A second specimen from Florida has the face and front wholly reddish, the latter darker than the face; the ocellar triangle, facial and frontal depressions, brownish. Thorax reddish, the pectus black, the dorsum with three broad,

fused greenish black stripes, the lateral pair of which do not reach the anterior margin and are separated from the median ones posteriorly by a reddish spot. Scutellum reddish. The general color of the abdomen is ferruginous, the third segment with a conspicuous yellow spot which is broadened behind, situated in the middle of the segment; sides of this segment and the anterior median portion of the fourth, reddish yellow. The apical crossveins are scarcely recurrent, the wings more brownish but pale posteriorly.

Two specimens; Clark county, Kansas, and Florida. One of the specimens was labeled *pachystylum* by Williston, the other was included under *fuscipennis* by some subsequent worker.

I have discussed the synonymy of this species under *M. globosus*, so need not repeat it here.

### 39. *Microdon piperi* Knab.

(Plates IV and V.)

*Microdon piperi* Knab, Trans. Biol. Soc. Wash., xxx, 136.

Metallic steel blue, with slight brassy cast; front of male wholly black pilose, of female almost so; abdomen black pilose beyond the third segment.

Length, 11 to 14 mm.

*Male*. Face and front steel blue, sides of the face divergent below; in profile slightly retreating, gently convex, just below the antennæ slightly swollen, more strongly retreating below. Lateral depression very narrow, obscure; pile not very abundant, pale brassy yellow. A linear longitudinal area above the antennæ and the transverse depression, shining black. Front strongly constricted below the middle, widening above until at the posterior angles of the eyes the width is about equal to the width of the face at the antennæ. Pile of the front black. Occiput narrowly yellow pollinose along the orbits, wholly black pilose. Posterior ocelli remote. Antennæ black; third segment with some yellowish pubescence, not quite as long as the first, its sides almost parallel, but a little narrower apically and curving slightly upwards; second segment about one-fourth as long as the first.

Thorax and scutellum metallic steel blue, the dorsum of the former with narrow, longitudinal brassy stripes, the sides more or less brassy. Pile brassy yellow. Scutellum with the end scarcely emarginate, bearing two broadly separated small spines just above the lower margin.

Legs black; bases of the tibiæ obscurely reddish. Pile black on the femora, chiefly yellow on the tibiæ.

Wings tinged with luteous, or almost hyaline. Stump of vein rising about the middle of the first posterior cell, oblique, curving apicad. Apex of the first posterior cell bulbous posteriorly, the cross-vein recurrent, straight on the last portion. Squamæ almost white or pallidly yellow, with yellow fringe. Halteres yellow.

Abdomen metallic steel blue with a brassy sheen. Second segment with the lateral margins scarcely raised; inside the anterior angles with a shallow depression and a broad depression in the middle basally. Third segment with a basal depression on the lateral third; fourth segment with hardly a trace of the usual depressions laterally and apically. Pile of the abdomen chiefly short, black; the first two segments, sides of the third and its posterior margin broadly, leaving only the median fourth, pale brassy pilose.

*Female.* Front scarcely narrowed above. Polished area above the antennæ wider; transverse groove less distinct, punctate; pile on the median part of the transverse groove, at the vertex and on the occiput above and below, brassy yellow. Posterior ocelli less remote than in the male.

Pile of the thorax and scutellum longer and more dense; on the sides and apex of the fourth segment there is a little yellow pile.

Male, Moscow mountain, Idaho, July 9 (A. L. Melander); female, Corvallis, Ore. (D. D. Green); male, mountains, Moscow, Idaho, June 25, 1920; male, July 10, 1920 (R. C. Shannon); male, Bonaparte Lake, Okanagan county, Washington; male, female, Penticton, B. C., June, 1916 (R. C. Treherne).

The general color, color of the pile and its arrangement, together with the shape of the antennal segments, are sufficient to distinguish this species from its allies.

### 40. *Microdon basicornis* n. sp.

(Plate IV.)

Very similar to *M. tristis*, but the pile is bright brassy yellow and the third antennal segment is much shorter; the scutellum is almost similar in shape.

Length, 10 mm.

*Male.* Eyes bare. Head bronze green. Face with almost parallel sides below; above narrowing in conjunction with the front, so that the narrowest part of the front is equal to the distance between the base of the antennæ and the anterior ocellus, the width at the vertex less than at the mindle of the face. In profile the face is receding from below the antennæ, strongly so on the lower portion, a little convex on the upper part, more strongly so below; side depressions practically wanting, the face moderately transversely convex. Front finely granular, its depression transverse, the shining area above the antennæ broad and broadly rounded above where it reaches the depression. Posterior ocelli moderately remote. Vertical bump small. Pile of the head wholly bright brassy yellow. Antennæ black, the third segment luteous or reddish on the basal three-fourths; third segment slightly shorter than the first, its sides almost parallel, its end rounded below, forming an obtuse point above. Arista almost as long as the third segment.

Thorax and scutellum shining greenish black, with bright brassy yellow pile; dorsum brassy, on the disc with three broad cupreous stripes separated by narrow greenish ones, the former evidently uniting to form a large cupreous bronzed area on the apical portion. Scutellum transverse, at each apical corner with a stout, transluscent yellowish spine which are not pilose, the actual apex of the scutellum a little emarginate, on the disc with a light depression.

Legs pitchy black, with similarly colored pile to that on the thorax; tarsal pads more tawny.

Wings greyish hyaline, the cross-veins scarcely darkened. The stump of vein projecting into the first posterior cell is short, directed obliquely outwards, situated slightly beyond the middle of the discal cell; apical cross-vein recurrent, ending behind the tip of the second longitudinal vein. Squamæ almost white, with white border and very short white fringe. Halteres reddish yellow.

Abdomen deep black, densely punctured, the apex of the fourth segment

broadly obscurely reddish. Second segment with rather deep depressions, leaving the sides, especially in front, strongly convex; on the base of the third segment behind these depressions, a narrow depression which curves around on the inner end and joins the latroapical depression, which, with that on the basal angles of the fourth segment, is rather conspicuous; the broadly V-shaped depression is quite distinct. Pile bright brassy yellow; basal two-thirds of the third segment and base of the fourth, more broadly in the middle and on each side, with black pile. Third segment about twice as long as the second in the middle, the fourth about twice as long as the third.

Holotype, male; Barber D., New Brunswick, June 23, 1914 (J. D. Tothill); in the Canadian national collection, Ottawa.

## 41. *Microdon aurulentus* Fabricius.

(Plate V.)

*Mulio aurulenta* Fabricius, Syst. Antl., 185.
*Microdon aurulentus* (Fabr.) Wiedemann, Auss. Zweifl., ii, 86. Williston, Synopsis, 11. Giglio-Tos, Ditt. del Mess., i, 35. Johnson, Ent. News, xii, 94.
*Aphritis aurulentus* (Fabr.) Macquart, Dipt. Exot., ii, 2, 12.
*Aphritis crassitarsis* Macquart, Dipt. Exot., Suppl., ii, 2, 38.
*Microdon crassitarsis* (Macq.), F. Lynch Arribalzaga, Dipt. Argent., 126.

Eyes bare. Bronze green, with golden yellow or golden pile; vertical bump small, well separated from the ocellar triangle; scutellar spines not large, broadly separated, the end of the scutellum evenly concave; stump of vein distinctly before the middle of the first posterior cell.

Length 12 to 14 mm.

*Female.* Head, thorax and abdomen bronze green. Face slightly convex above, convex-receding below; on the sides above with narrow, shallow orbital depressions; pile abundant, yellow. Sides of the face and front almost parallel. Front bronze green or black, without a transverse depression, but on the lower third with lateral, triangular, more densely punctured depressions which extend more narrowly down to the facial depressions, their inner ends rather rounded. Above the antennæ with a shield-shaped polished area. Posterior ocelli remote, the space between them polished. Vertical bump small, like a tubercular swelling, moderately roughened above, widely separated from the ocelli. Pile of the front golden yellow. Occiput piceous, with golden pile, which is more condensed along the eyes. Antennæ black, first segment yellowish red or reddish, about equal in length to the two following segments combined. Second segment almost one-third as long as the third; third rather stout, not three times as long as broad, somewhat narrowed beneath apically, the end rounded.

Thorax and scutellum with golden yellow pile. Pectus blackish. Scutellum a little swollen, its end broadly and evenly shallowly concave, the spines moderate in size, situated above the lower margin on the angles of the concavity.

Legs blackish brown, the tibæ and tarsi so densely pilose as to almost conceal the ground color. Tarsi not swollen.

Wings somewhat fuscous; stigma luteous. Stump of vein projecting into the first posterior cell rising distinctly before the middle of the cell, somewhat curved apically. Apical cross-vein extending rather close to the wing margin before curving inward to join the third vein before the tip of the second.

Squamæ white, with yellow border and short yellow fringe. Halteres reddish yellow.

First abdominal segment blackish green, not punctured. Second segment about twice as long as the first, the disc shallowly depressed; third segment not twice as long as the second, the base somewhat depressed, darker and more coarsely punctured; a shallow depression inside the posterior angles. Fourth segment one and one-fourth times as long as the third, the lateral depressions shallow. Fifth segment a little longer than the fourth, transversely diamond-shaped, with well-marked sublateral depressions. Pile rather long, golden yellow, subappressed, the bases of the segments with shorter black pile, which expands laterally to form subtriangular-shaped areas, but does not reach the lateral margins; a slender median projection caudad also black pilose.

*Male.* Front moderately narrowed on the lower third, with a well-marked transverse depression; the polished area above the antennæ almost wholly occupied by an oval, swollen, medianly impressed area; above the depression the front widens moderately, but is not as wide as the face at the posterior angles of the eyes, and the ground color is cupreous bronzed, while on the face and below the depression it is metallic blue; first antennal segment reddish, the last two blackish, the incisure between the second and third segments broadly reddish; arista pale yellow.

Sides of the dorsum of the thorax behind the base of the wings broadly reddish yellow or reddish, the scutellum largely similar, somewhat translucent, with a bluish reflection and the base decidedly bluish.

Legs brown; the apices of the femora and the tibiæ, except postmedian rings, reddish or yellow. Wings decidedly fuscous along the veins.

Abdomen with a narrow median, more or less interrupted, incomplete stripe blackish pilose. The whole insect bears much brighter and more dense golden pubescence than the female, and from an anterior view the ground color of the abdomen is entirely concealed, except on the second segment, by the appressed golden pile.

Female, Dauphin, Pa., June 6, 1909 (A. B. Champlain); male, Falls Church, Va., June 29 (C. T. Greene).

The specimens before me agree perfectly with Macquart's description, which was made from Fabricius' type female, except that the size of both specimens is larger. The type specimen was only 8 mm. The male differs considerably in color, but agrees in other respects, and at least belongs with the female described above. The only possible confusion which might exist as to identity might be with the following species. *M. aurulentus* has been reported from Pennsylvania, Carolina, Mexico, Argentina and Brazil.

## 42. *Microdon ocellaris* n. sp.

(Plate III.)

Eyes bare; front (of female) over one-third the width of the head; bronze green, with long yellow pile; differs from *aurulentus* in the larger, rugose vertical bump, more approximated ocelli, lighter pile, larger and slightly more approximated scutellar spines, position of the stump of vein, etc.

Length 14 mm.

*Female*. Head, thorax and abdomen wholly bronze green. Face with the sides almost parallel; in profile a little convex above, strongly so below; side depressions and a narrow margin along the orbits, greyish silvery pollinose, but the depression otherwise not conspicuous. Front scarcely narrowed above, without a complete transverse depression, but there is a distinct depression extending about one-third the distance across the lower portion, its inner margin running obliquely downwards to join the upper end of the facial depression; from the innermost point of this depression a slender depression runs into the uppermost corners of the polished squarish black area above the antennæ. Posterior ocelli remote, the ocellar triangle small. Vertical bump squarish, large, not actually connected with the ocellar triangle, its upper surface rugosely granular. Pile of the head rather thick and long, brassy straw yellow, a stripe across the middle of the cheeks almost bare. Antennæ black; first segment scarcely as long as the two following combined, the second about one-third as long as the third; third rather stout, thickest at about its basal third, its end obtusely rounded; first segment somewhat piceous basally. Arista reddish, slender, about as long as the third segment.

Pectus brownish black. Thorax with moderately long, dense, brassy yellow pile. Scutellum swollen, its caudal angles rather bulbous, so that the concavity, while moderately deep, is rather more pronounced just at its middle; apex of the scutellum somewhat transverse; spines broadly separated, stout, concolorous with the scutellum; situated on the swellings, well above the lower margin.

Legs brownish, the tibiæ and tarsi so densely covered with subappressed shining pale yellow pile as to obscure the ground color. Inside of the front tibiæ apically and the pads of their tarsi, golden. Tarsi not at all swollen.

Wings somewhat cinereous luteous, the apical cross-veins faintly clouded. Stigma somewhat yellowish. First posterior cell elongate posteriorly, as the apical cross-vein extends rather close to the wing margin before curving rather sharply back to join the third longitudinal vein before the tip of the second. Stump of vein projecting into the first posterior cell arising about the middle, very sharply curved, directed towards the end of the spurious vein. Squamæ yellow with yellow fringe. Halteres yellow.

First abdominal segment black. Second segment twice as long as the first, somewhat depressed on the disc, the sides broadly convex; third segment not quite twice as long as the second, the posterior angles broadly but shallowly depressed; darker and more coarsely granularly punctured basally; fourth segment one and one-fourth times as long as the third, with the usual shallowly depressed area laterally; fifth segment transversely diamond shaped, with conspicuous sublateral depressions. Fourth and fifth segments with a dark longitudinal median line. Pile brassy yellow, mostly moderately long and subappressed; bases of the third, fourth and fifth segments with short black pile which expands laterally to form triangular patches which do not reach the lateral or posterior margins.

Holotype, female; Linglestown, Pa.; June 14, 1920 (A. B. Champlain); in the museum of the Bureau of Plant Industry, Harrisburg, Pa.

Additional specimens: ♂, Lyme, Conn., Aug. 30, 1911; ♂, Lyme, June 1, 1918; 2 ♂, Linglestown, June 3, 1919; ♂, Lyme, April 30, 1911 (all Champlain); 2 ♀, Darien, Conn., June 12, 1915 (C. W. Johnson); 2 ♀, Newton, Mass., May; ♂, Framingham, Mass. (Frost).

This species has been confused with *M. aurulentus* and was received as probably that species. In the single specimen the color of the pile is very distinctive, but while this may be variable, the structural characters, especially the remarkably prominent vertical bump, appear to be quite distinctive.

## 43. *Microdon viridis* Townsend.

*Microdon viridis* Towns., Proc. Cal. Acad. Sci., iv (2), 610. Hunter, Can. Ent., xxix, 123.

"Length, 7 mm.

"*Female*. Bright green. Face and front brilliant bright green, the latter with a slight bluish reflection. Face with dense whitish pile. Antennæ brown; first two segments somewhat shining; third segment with an opaque whitish bloom in certain lights; third segment hardly shorter than the first.

"Thorax green, with a purplish luster on the disc; scutellum bright green with two moderately approximated rather slender sharp spines. Thorax and scutellum with whitish pile. Pleuræ bright green, whitish pilose. Abdomen bright green, somewhat purplish on the hind half and sides; the whole with whitish pubescence shorter than that on thorax and scutellum, but that on the sides and extremity is longer than that on the dorsal areas. Venter greenish, less so on the sides. Femora bright green, their tips and the whole of the tibiæ yellowish, with a brownish tinge; hind tibiæ with a median green spot on the outer surface. Tarsi dark brownish; hind basitarsi decidedly incrassate. Wings nearly clear, some of the cross-veins slightly yellowish infuscated." (Townsend, *l. c.*)

Originally described from lower California; reported by Hunter from Tennessee.

While it is possible that Hunter had this species before him, it is also possible that he had the following species, which agrees moderately well with Townsend's description.

## 44. *Microdon craigheadi* Walton.

(Plates V and IX.)

*Microdon craigheadi* Walton, Ent. News, xxii, 318.

Abdomen metallic green, the last two segments cupreous in the female; scutellum with spines; second abdominal segment with a roundish depression inside the basal angles and a transverse one in the middle basally.

Length, 9.5 to 10.5 mm.

*Male*. Face and front metallic bluish green with a slight brassy reflection in some lights; face not one-third the width of the head, its sides almost parallel; in profile with a rather prominent swelling above, just below the antennæ, thence very slightly receding to the lower fifth, where it recedes greatly to the oral margin. Cheeks narrow. Front at the lower third scarcely over half as wide as at the ocellar triangle. Pile of the head yellow; black on the front except across the narrowest point. Antennæ longer than the face; brown, appearing black in some lights, the third segment always appearing more brownish. Arista luteous, not longer than the third segment. First segment not quite as long as the two following combined, with an apical fringe of short, stout, black hairs; second segment about one-fourth the length of the third, which is a little shorter than the first; third segment rather sharply rounded apically, widest at its middle, the convexity below.

Thorax and scutellum metallic greenish with a strong bluish reflection and a slight brassy reflection in some lights, or bright metallic blue; below the scutellum more blackish. Pile pale yellowish. Scutellum a little emarginate

apically, bearing on each apical corner a stout, moderately long spine, the spines moderately separated.

Legs black, the posterior four femora metallic green; anterior femora with dense reddish pubescence ventrobasally; basal tarsal segments with similar colored cushions.

Wings almost hyaline; last section of the fourth vein recurrent, joining the third longitudinal vein before the tip of the second; spurious vein ending opposite the stump of vein, which is directed slightly outwards. Stigmal cell not clouded; with a small, brown basal spot. Squamæ whitish yellow, with yellowish fringe. Halteres yellow.

Abdomen metallic greenish, with a slight blue reflection on the disc, or the disc bright metallic blue; first segment and abdominal margins with a brassy reflection. First segment in the shape of an inverted arch of nearly equal width throughout. Second segment scarcely twice as long as the first; in the middle with a transverse impression basally, which extends about one-eighth the width of the segment on each side of the middle, and a deep depression inside the anterior angles. Third segment about twice as long as the middle of the second; fourth segment twice as long as the third. The pile appears more or less blackish on the disc of the third and fourth segments; on the first two segments it is pale yellow; on the anterior angles of the third and fourth segments and on the apical third of the fourth it forms triangular areas of a deeper yellow color.

*Female.* Front very slightly narrowed in the middle, the transverse impression light and not extending over the median line; pile more broadly white on the transverse depression.

In my single example the dorsum of the thorax is wholly bright metallic blue, only the sides and the sides of the scutellum metallic brassy.

Abdomen with the base and side margins metallic greenish, more or less strongly brassy; disc of the second and third segments deep metallic blue, the third with a slight purplish tinge; fourth and fifth segments cupreous bronzed; pile lighter, almost white on the fourth and fifth segments; the blackish pile is in the shape of a chicken's foot, the toes pointing towards the apex and forming a complete, longitudinal, dark-appearing stripe on these two segments. The fourth segment is longer than the third, and its sides are a little longer than its middle; the third is of equal length throughout; fifth segment about equal in length to the fourth strongly convex.

Female, Rockville, Pa., July 23, 1912 (A. B. Champlain); male, Rockville, Pa., August 4, 1909 (W. R. Walton); male, Cherokee county, Kansas, 1915. (Beamer.)

This species is very distinct and may be easily recognized by the shape of the second abdominal segment, the deep impressions and the elongate first antennal segment, together with the color and arrangement of the pile.

### 45. *Microdon scitulus* Williston.

*Microdon scitulus* Williston, Synopsis, 10.

A small, slender greenish species, which is distinguished from the subgenus *Omegasyrphus* by the short, narrower basally, second abdominal segment which entirely lacks depressions. The abdominal segments appear semifused, and do not seem to be freely movable.

Length, 6 to 6.5 mm.

*Male.* Eyes very short pilose. Face and front shining metallic greenish with a more or less brassy reflection; sides of the face almost parallel, the front only a little narrowed on the lower third, the biarcuate impression not very distinct. Ocelli equidistant, their triangle extending narrowly to the middle of the front, and indistinctly to the vertex above. Face almost evenly convex between the base of the antennæ and the oral margin, but a little more retreating on the lower half; pile moderately abundant, pale yellowish. Front brown pilose; tawny across the impressed area and at the ocelli. Antennæ brown, the first segment black, the second more or less piceous; third segment as long as the first two combined, almost cylindrical, a little over three times as long as broad, its apex somewhat narrowed and almost evenly rounded.

Thorax metallic bluish green, the dorsum with a brassy reflection. Pile tawny. Scutellum metallic bluish, armed with two moderately separated spines, between which there is a shallow concavity; no dorsal markings; pile as on the dorsum of the thorax.

Legs reddish; the femora, except the apical ends, metallic green; subapical tarsal segments and narrow median tibial annules sometimes greenish or blackish. The anterior femora are more or less reddish ventrobasally and bear a pad of yellowish white pubescence.

Wings cinerous hyaline, the cross-veins usually a little clouded; apical cross-veins a little recurrent, that closing the first posterior cell joining the third longitudinal vein opposite the tip of the second. The stump of vein projecting into the first posterior cell is directed a little outwards; a dark spot on the base of the stigmal cell.

Abdomen metallic green, with more or less bronze or brassy reflection, especially on the disc. First segment blue green; second segment about twice as long as the first, finely transversely wrinkled apically; third segment over twice as long as the second, the segmentation between this and the fourth segment not so well marked medianly, finely densely punctured. Fourth segment about twice as long as the third, finely densely punctured, the apex and a narrow median longitudinal line on the basal portion, and also the apex of the third segment, not punctured. Pile pale yellowish, longer on the apex of the third and apical half of the fourth segments.

*Female.* Very similar to the male. Face and front of equal width throughout, metallic bluish or green. On the disc of the thorax, behind the middle, also present in the male, a large bluish or somewhat bronzed spot, with three narrow bronze stripes, sometimes with a short, slender bronze stripe before the suture laterally. Tibiæ usually wholly reddish yellow. The stump of vein extending into the first posterior cell rises distinctly beyond the middle of the cell.

Fourth and fifth abdominal segments with scarcely any indication of an incisure medianly, only moderately marked on the sides; on the third and fifth segments the black pile is in the form of a moderately broad basal triangle, which does not reach the apex or sides of the segments; on the fourth it occupies the base, except at the sides, and expands laterally.

Seventeen specimens from Maryland and Mississippi.

The exact position of this species is somewhat doubtful. In the male the eyes are extremely short, sparsely pubescent, but in the female the pile is rather distinct, but still short. I had not noticed this character until checking

up the descriptions, and Williston states that the eyes are bare. They appear to be in the male, unless closely searched for under good light. The abdominal segments are more fused than in any other species I have examined, and the whole structure of the insect is somewhat foreign to *Microdon*. Perhaps it should be placed in the subgenus *Serichlamys* along with *M. rufipes*.

### Subgenus OMEGASYRPHUS Giglio-Tos.

*Omegasyrphus* Giglio-Tos, Boll. Mus. Zoöl., vi, No. 108, 4, 1891; Ditt. del Mess., i, 38, 1892.

This subgenus is distinguished from *Microdon* by the laterally almost evenly convex sides of the second abdominal segment, together with the fact that the second segment is almost as long as the third; the curved first antennal segment and the rather drooping antennæ. These characters are not present in *M. craigheadi* Walton, and there is therefore no intergradation of a really close nature. I think the genus should be recognized as distinct. There are only four species, all of which have been recorded from north of Mexico. Type: *M. coarctatus Lw.*

### 46. *Microdon coarctatus* Loew.

(Plate V.)

*Microdon coarctatus* Loew, Cent. v, 47. Williston, Synopsis, 6.
*Omegasyrphus coarctatus* Giglio-Tos, Boll. R. Univ. Tor., vii, No. 118; Ditt. dell Mess., i, 39.

Very much like *M. baliopterus*, but the third antennal segment is longer and more pointed, the scutellar spines more widely separated and the abdomen with a distinctly bluish tinge.

Length, 9 to 10 mm.

*Male*. Eyes bare. Face and front shining black, with a bluish tinge, the front only a little narrowed about the middle. In profile the face is produced just below the antennæ, thence evenly convex receding below. Front below the middle with a curved transverse depression; a longitudinal median depression extending towards the antennæ, branching and leaving a triangular prominent area just above their base. Ocelli equidistant, placed well forward. Pile of the face and front somewhat yellowish. Occiput, concave, with pallid, subsilvery pile. Antennæ black, second and third segments somewhat brownish; first and third segments about equal in length, the second very short; third, above, tapering to an obtuse point from before the middle. Arista reddish, about three-fourths as long as the third segment.

Thorax bronze black, the pectus bluish black. Pile sparse, moderately short, pallidly yellow. Scutellum and end of the dorsum of the thorax metallic steel blue, the former with two small spines, which are separated by at least one and one-half times the length of a spine, the apex of the scutellum almost truncate between them; spines reddish on their apical third.

Femora shining black, their apices yellow; apices of the anterior four coxæ yellowish; tibiæ reddish yellow, with a more or less distinct, usually obscure, piceous or blackish subapical band; tarsi brownish. Pile of the legs whitish.

Wings hyaline or nearly so, all the cross-veins margined with brown. Stump of vein extending into the first posterior cell slightly oblique, straight, rising just beyond the middle of the cell. Apical cross-vein almost straight beyond the initial bend, slightly recurrent, joining the third vein beyond the tip of the second. Squamæ scarcely tinged with yellowish, the border, fringe and halteres pale yellow.

Abdomen bluish green, the sides more bronzed, the base more clearly blue; lateral and apical borders of the fourth segment and the lateral borders of the third, obscurely reddish or piceous; tip of the second segment somewhat yellowish laterally. Second segment with a deep, narrow, incomplete basal depression and more shallow, broader sublateral ones; the sides of the segment strongly convex, usually also the median basal portion is raised; segment widest at the basal third, the sides convex from front to rear. Third segment with the basal depression which extends caudad on the middle; on the base in the middle with a raised triangular area. Fourth segment without depressions, strongly convex. Pile whitish; on the base of the third segment, not reaching the sides, but extending caudad sublaterally, and a similar area on the fourth segment, with black pile; on the fourth segment there is a patch of tawny pile in front of the black pile laterally.

*Female.* Front slightly narrower above than at the antennæ; face narrower below. Third antennal segment only a little narrower apically and not pointed.

Spines of the scutellum slightly more approximate, slightly longer than in the male specimen. The pile on the third to fifth abdominal segments is arranged as on the third segment of the male.

Described from a male and female specimen from Opelouses, La.; April and May.

Superficially this species is very similar to *M. baliopterus* Loew, but the color and greater distance between the scutellar spines will at once distinguish them. It is possible that the caudal portion of the abdomen may be more extensively reddish than described here, and there may be no yellow on the apex of the second segment.

The species is also reported from Florida and Mexico, and was originally described from the District of Columbia.

## 47. *Microdon baliopterus* Loew.

(Plates V and IX.)

*Microdon baliopterus* Loew, Cent. x, 56. Williston, Synopsis, 5; Biol. Dipt. iii, 3.
*Omegasyrphus baliopterus* (Loew) Johnson.

Length, 11 mm.

*Male.* Face shining bronzed, produced below the antennæ, thence convex, retreating to the oral margin; white pilose. Front very slightly narrowed before its middle, bronzed posteriorly, with a slight brassy reflection before the V-shaped impression. Pile rather yellowish. Eyes bare. Posterior orbits and cheeks whitish pilose. Antennæ piceous, third segment brownish except its base; arista luteous; first and third segments about equal in length, the second about one-fourth as long as the first.

Thorax metallic purplish bronzed, with three rather narrow brassy stripes. Pile of the dorsum short, subappressed, yellowish; white and longer on the pleuræ. Scutellum purplish bronzed, with very little whitish pile, the spines

very much approximated, separated by not more than the length of a spine.

Legs reddish, the femora except below and apically, blackish; hind basitarsi long, not noticeably dilated. Pile whitish.

Wings hyaline; a spot at the origin of vein $R_{4-5}$, a fascia across the middle of the wing, reaching to the sixth longitudinal vein, and the veins closing the first posterior and discal cells, brownish; costal and subcostal cells somewhat infuscated apically. Squamæ whitish with yellow border and whitish fringe. Halteres yellow apically.

Abdomen strongly metallic brassy greenish, the basal impressed area on the second segment opaque, the sides of the third and fourth segments becoming brownish, the latter brownish red apically. Pile subappressed yellow on the disc, white on the lateral margins, except posteriorly on the third segment, and forming bands posteriorly on the third segment, the base of the fourth and the apex of the fourth.

Ten specimens, all males, from Texas, Mississippi, New Mexico and Kansas. Texas is the type locality. Also recorded from Florida and Mexico. I have also a Canadian specimen of uncertain origin.

## 48. *Microdon painteri* Hull.

(Plates V and IX.)

*Microdon painteri* Hull.*

Length, 10 mm.

*Male.* Face prominent just below the antennæ, thence convex, slightly retreating to the oral margin, covered with somewhat wavy pale yellow pile; ground color metallic purplish bronze. Front very slightly wider at the apex than at the narrowest point, which is at the anterior third; although this point is scarcely differentiated, there is an anteriorly arcuated impression indicating it. Front similar in color to the face; the pile tawny. Posterior orbits and cheeks whitish pilose. Antennæ dull black; first segment red, its lower apical portion more brownish; long, cylindrical, about the same length as the third; second segment about one-third as long as the first; third about twice as long as broad, its upper end subpointed; arista about as long as the third segment, thick basally, the apical two-thirds very slender, base brownish, the apex yellow.

Thorax and scutellum metallic bronze, with a broad median and narrower sublateral stripes of violet grey pubescence, which have a more or less silvery reflection in some lights, the stripes present on only the anterior three-fourths of the dorsum. Pile sparse, reclinate, white, inclined to yellowish on the disc. Scutellar spines situated at the sides of a slight concavity, separated by a little more than the length of one spine.

Femora shining black, their tips reddish; trochanters reddish apically; tibiæ piceous reddish, with a piceous area outwardly near the end; anterior four tarsi piceous, the hind ones brown. Legs with white pile.

Wings hyaline, with a rather broad brown cloud across the middle as far as the sixth longitudinal vein and a narrow cloud across the veins closing the discal and first posterior cells; marginal and submarginal cells somewhat infuscated; stigma luteous.

Abdomen slightly shining reddish or piceous luteous, the first segment black;

* This species has been described, but the description has not been published at date of writing.

second segment with a small or moderately large basal triangular brownish area, covering broad, contiguous depressions on the anterior border and in the middle of the segment; on each side there is also an impressed area, so that the lateral margins are strongly convex. There are indications of a fine, median impressed longitudinal line on the second and third segments. Pile short, black; on the first two segments, except the dark areas, of the second segment, the abdominal side margins wholly, and basal triangles on the third and fourth segments, together with their complete hind margins, with fine, longer, white pile.

*Female.* Front a little narrowed opposite the ocelli, the sides almost parallel above; pile behind the ocelli cinereous, perhaps a little more yellowish at the vertex.

Abdomen wholly luteous reddish; third, fourth and fifth segments of almost equal length, the segments practically fused, the incisure more or less distinct in the middle, scarcely or not at all discernible at the sides, especially between the last two segments. Pile as in the male, the fifth segment similar.

Wings less distinctly fasciate. Legs more yellowish, the tarsi only a little brownish.

These differences in coloration between the two sexes probably represent only variations which might occur in either sex.

The description is made from the holotype, allotype and one male paratype. The allotype is in the collection of Doctor Reinhard, and not in my collection. A paratype is in my collection. The species occurs in Texas and Mississippi.

This species is closely related to *M. baliopterus*, but the color of the abdomen appears quite distinctive, the third segment is longer, the fourth a little shorter, etc.

### 49. *Microdon pallipennis* n. sp.

(Plates V and IX.)

*Omegasyrphus* sp., Snow, Kans. Univ. Quart., iii, 226.

Length, about 10 mm.

Head shining black, with a brassy bronze reflection; front more bronzed than the face, distinctly but slightly narrowed at the broadly V-shaped depression below its middle; pile whitish, tinged with yellowish on the front. Eyes bare. Antennæ black, third segment a little longer than the first, more rounded than in *baliopterus* and *painteri*.

Thorax brassy shining black, the dorsum with three purplish stripes; pile whitish, somewhat long; longer on the pleuræ. Scutellum concolorous with the thorax, its end rather deeply, narrowly emarginate, so that the spines appear rather long, but are actually short, the distance between the spines being about one and one-half times the length of a spine. Scutellar pile white.

Femora shining black; tips of the femora, and the tibiæ wholly, reddish; tarsi brownish, the basal segments more or less reddish. Hind basitarsi moderately thickened.

Wings with the anterior apical half brownish or blackish before the third longitudinal vein, with a rather broad fascia extending backward at the middle and two narrower ones towards the apex, none of which reach the hind border of the wing; a dot at the origin of vein $R_{4+5}$ brown. Wings elsewhere hyaline.

Abdomen shining metallic greenish, with brassy reflections, the disc of the second segment with metallic bluish reflections in some lights. First segment, except the sides, and the depressed area on the second segment, which does not extend as far back as in allied species, subopaque. Pile whitish, forming bands on the bases and apices of the second to fourth segments.

Specimens: Male, Garden of the Gods, Colorado, July (E. S. Tucker). This is the specimen described by Snow as *Omegasyrphus* sp. in the Kansas University Quarterly, 1895. The specimen now lacks its head. Two additional specimens from Texas; Austin, April 10 and October 15, 1921 (R. H. Painter).

Jones has referred to this species (the identical specimen described by Snow), but stated that he could find no reference or description of it.

I have been unable to discover that the species has been named, but believe that Snow decided that it was distinct and applied a name which he later neglected to publish. The result is that the species has remained unknown except for the above-mentioned description by Snow. It appears to be a fairly common species along the Gulf, and it seems strange that it has not been recognized previously. The originally described specimen is labeled *"pallipennis"* in Snow's writing, and I have used his name, although doubtful whether it has ever been properly applied. The name does not appear to be very suitable.

## GENUS SYRPHUS Fabricius.

The limits of this genus are changed in the present work to include only those species which have the abdominal margin raised or swollen on at least the second and third segments, and the sides of the segments visible from above, not thin and curving under; face yellow, with or without a median black stripe; eyes of the male contiguous; bare or pilose; abdomen with yellow spots or bands; pleuræ rarely obscurely reddish in the middle; sides of the mesonotum rarely diffuse reddish or yellowish; rarely there are lighter markings on the dorsum of the thorax; legs simple; third longitudinal vein ending at or close to the tip of the wing; sometimes more or less undulated, but never deeply looped into the first posterior cell; anterior cross-vein well before the middle of the discal cell; first posterior cell long, more or less angulated in front apically. The type of the genus is *Syrphus ribesii* L.

### 50. *Syrphus aberrantis* n. sp.

(Plate VI.)

Third longitudinal vein curved as in *lapponicus** second and third abdominal bands entire and undulated, but not reaching the side margins; the first pair of spots may or may not extend narrowly forward to the anterolateral margin of the second segment.

Length, 9 to 11 mm.

* Lundbeck has shown that our species is not *arcuatus*, but is either *lapponicus* or a new species.

*Male.* Eyes bare. Face shining reddish yellow, a median stripe which is broadest below and extends above to the middle of the concavity, the oral margin and the cheeks, shining black or brownish black, more or less bronzed on the jowls. In profile very slightly concave between the base of the antennæ and the tip of the not prominent tubercle, below which it is receding almost to the anterior oral tip. Pile rather long, stout, black. Frontal triangle concolorous with the face, a broad, rounded W black; large, broad and a little swollen, with dense, coarse, black pile, especially above. Upper part of the frontal triangle with thin whitish pollen. Vertical triangle greenish, with short black pile; ocelli equidistant. Occiput with yellowish grey or grey pollen and yellow or pallid pile. Occipital ciliæ numerous, black. Antennæ reddish; second segment above and the upper half of the third, brownish. Arista brownish, moderately thickened except basally and the apical fourth.

Thorax shining metallic blackish green, with pale yellow or yellowish pile, more fulvous on the sides of the dorsum and paler on the pleuræ. Scutellum fuscous yellow, the base and angles blackish or brown; pile usually pale basally, longer black on the apical half.

Legs reddish; basal fourth or a little more of the anterior four femora, the hind ones except the broad apex, and an obscure band about the middle of the hind tibiæ, black. Median segments of the hind tarsi brownish.

Wings hyaline, rarely slightly tinged with yellowish; stigma and subcostal cells luteous; third vein suddenly curving forward about the middle of the first posterior cell and joining the costa just before the tip of the wing. Squamæ yellowish, with yellow border and fringe. Halteres yellow.

Abdomen shining black, the second segment chiefly, the third and fourth behind and before the yellow bands opaque or subopaque. Second segment with a pair of elongate, widely separated yellow spots, their inner ends narrowed and rather pointed, the outer end broad, sometimes produced narrowly forward to the anterior angles of the segment, or the spots may be a little lunulate, concave in front; situated about the middle of the segment. The band on the third segment is situated a little before the middle and is usually strongly undulated; in front excavated in the middle, concave laterally; behind, broadly moderately notched in the middle, convex on each side; the front of the band approaches a little closer to the lateral margin; third band similar. The apex of the fourth segment, not reaching the sides, the apex of the fifth, and usually small spots on its anterior angles, yellow or reddish. The abdominal markings vary in color from light yellow to reddish yellow. Pile black, moderately long; on the basal angles long, yellow; shorter yellow on the base of the abdomen before the first pair of spots and on the yellow bands.

*Female.* Facial stripe a little narrower; oral margin usually very narrowly brownish, but sometimes broadly so; tubercle a little more prominent; pile finer; cheeks lighter colored. Front concolorous with the face on more than the lower half, the yellow extending further up along the sides, leaving a median, squarish abutment of the shining black color; front chiefly thinly yellowish pilose.

Thorax usually a little darker, the sides of the dorsum often somewhat reddish. Legs as in the male, or practically all reddish.

Abdomen more shining, at most subopaque, the spots and bands narrower, the basal spots less pointed inwardly and much more inclined to reach for-

ward laterally to the anterolateral margin; sometimes doing so rather broadly, but often scarcely prolonged.

Holotype, male, Mount Rainier, Paradise Park, Washington, 1921; Allotype, female, same locality, August, 1917 (A. L. Melander), in Doctor Melander's collection. Paratypes, thirty-two specimens from the same locality, August; Priest Lake, Idaho, August 20 (A. L. Melander); Moscow, Idaho, July, 1910 (R. C. Shannon).

This species is very distinct from any other yet described, and the characters enumerated in the first paragraph should be sufficient to distinguish it at once. It is evidently related to the *nitens* group, but the strongly curved third vein at once separates it, and indicates a relationship with *lapponicus*. The front of the female is slightly broader than in the female of the latter species and much broader than in *nitens*. It is readily distinguished from *opinator* by the bare squamæ and black facial stripe. It is scarcely possible that this is *fumipennis* Thomson, as it does not agree at all well with the description of that species, which seems to be more like a form of *nitens*.

## 51. *Syrphus lotus* Williston.

(Plate VI.)

Belongs to the *intrudens* group, but the second and third abdominal bands are united medianly in almost their full width; none of the bands go over the side margins; eyes pilose.

Length, 10 mm.

*Female.* Face greenish yellow not pollinose, except at the extreme eye margins; cheeks, before the jowls, the oral margin narrowly and a moderately broad facial stripe which widens a little above, shining black. Face and cheeks with black pile. Front moderately narrowed above, deep shining black, across the middle with a complete, broad band of greyish yellow pollen, which extends narrowly downwards along the eyes. The W above the antennæ reddish. Ocelli almost equidistant. Occiput grey pollinose, above, rusty yellow pollinose; pile white below, fulvous above. Antennæ black or brown, all the segments more or less reddish beneath. Arista black.

Thorax aëneous black or metallic bluish black, with a very slender median and a broader, incomplete, slightly obliquely placed stripe on each side, olivaceous opaque. Pile moderately abundant, fulvous, more abundant on the sides of the dorsum, yellowish on the pleuræ. Scutellum dull translucent yellowish, with a metallic blue reflection; pile black.

Legs reddish yellow; bases of the femora, an obscure band on the hind tibiæ and the apical segments of the posterior tarsi, black.

Wings hyaline. Squamæ white, with yellow border and fringe. Halteres sulphur yellow.

Abdomen deep black, moderately shining, the second segment subopaque on the disc. Second segment with a pair of elongate yellow spots, their inner ends rounded, the outer ends cut off obliquely; inner ends closer to the front margin than the outer ends, the spots very slightly concave in front, convex behind. The band on the third segment touches the anterior margin for fully half the width of the segment and is then suddenly and broadly separated from it by an elongate black spot, the inner end of which is rounded, its posterior margin very slightly convex so that the yellow band slightly approaches the

anterior margin at the lateral end; posteriorly the band is bordered in the middle by a very broad inverted black V, which occupies about three-fifths the width of the segment; towards the sides the posterior margin of the band is transverse or a little convex. Fifth segment with a similar band. Tip of the fourth segment incompletely, tip of the fifth and roundish spots inside the anterior angles of the fifth segment, yellow. All the yellow or greenish yellow bands are separated from the lateral margins, except that on the fifth segment.

Eight specimens; Arizona, New Mexico, Idaho and Washington.

### 52. *Syrphus neoperplexus* n. sp.

Eyes bare. Abdomen with three pairs of spots, the last two pairs lunulate or arcuate; face without a median black stripe; legs reddish except the bases of the femora.

Length, 12 mm.

*Male*. Face and front reddish, the tubercle rather piceous reddish; oral margin piceous reddish, the jowls aëneous. Sides of the face very narrowly yellow pollinose; pile wholly yellow. Tubercle large, nose-shaped, face a little concave above it, below rather receding, but the oral margin prominent. Frontal triangle not swollen, with a brownish spot above the antennæ, interrupted in the middle; thinly yellow pollinose except an arch immediately above the antennæ; black pilose. Vertical triangle long and narrow, not acute anteriorly, its pile black. Ocelli almost equidistant. Occiput densely yellow pollinose; with white pile, which becomes fulvous at the vertex. Antennæ reddish, brownish above. Arista red, rather slender and tapering.

Thorax aëneous greenish, the sides appearing reddish; pleuræ brassy, the pectus greenish. Pile of the thorax bright yellowish red, the tips of the hairs appearing cinereous; condensed on the lateral margins, much paler on the pleuræ, especially below. Scutellum obscure honey yellow, its pile black on the disc, cinereous yellow on the border.

Legs dusky reddish; about the basal fourth of the femora shining black.

Wings faintly tinged with yellow; stigma and costal cell luteous. The third vein ends well before the tip of the wing and is somewhat curved forward about the apical fourth of the first posterior cell, but not strongly so. Squamæ whitish, with yellow border and fringe. Halteres yellow, the stems more brownish.

Abdomen opaque black; the tips of the segments, lateral abdominal margins and the fifth segment wholly, shining. First segment metallic bluish. Abdominal spots yellow. Spots on the second segment, near the middle of the segment, widely separated, transverse subtriangular, their inner ends pointed, on the outer portion of the spots their sides parallel, the outer end truncate. Spots on the third segment arcuate, rather broad, concave in front, convex behind, their anterior outer corner closer to the lateral margin. Spots on the fourth segment a little less arcuate, placed more obliquely. Tip of the fourth segment reddish yellow; fifth segment red, with a basal oval black spot. Pile of the abdomen short, black; basally and on the yellow spots, yellow. Venter with three broad, transverse, brownish bands on the posterior of the segments, a triangular anterior projection on each end of the spot.

Holotype, male; Hussavick, Man., July 5, 1916 (J. B. Wallis); in the author's collection.

This species approaches *S. lapponicus*, but is distinguished by the much less curved third longitudinal vein, and is distinguished from *perplexus* by the reddish yellow thoracal pile. It approaches *arcuatus* Fallen much more than do any of our other North American species, but the front is not swollen and the first spots do not extend over the side margins. It differs from all the species of this group by lacking a definite facial black stripe and in having more extensively reddish legs.

## GENUS STENOSYRPHUS Matsumura.*

I have split this genus off from *Syrphus* on the character of the absence of the raised lateral margin; the margin of the abdomen in practically all the species of the genus is thinned, and as a result curves under. *Ischyrosyrphus* is recognized as a distinct genus, but is actually very feebly characterized, but has the advantage of permitting both sexes to be readily split off and correctly associated. There may be strong objections, but students of the family have recognized the extreme difficulty in working with this group, and I believe simplicity can best be arrived at by recognizing several genera, especially when the females are readily associated and may be easily keyed out.

*Stenosyrphus* agrees with *Syrphus* except as stated above. The sides of the metanotum may be yellow; there are rarely yellow areas on the pleuræ, but these are invariably diffuse and not sharply limited, except, perhaps, in one or two cases. The eyes may be bare or pilose, but the latter condition is not very common and the pile is never conspicuous in the females, as it is in *Ischyrosyrphus*. In two or three species the sides of the second segment and the base of the third may be slightly margined, but the apical half of the third segment does not bear any indication of a raised line.

In his treatment of the Syrphini Matsumura split the genus *Syrphus* into several genera, but in the light of the material before me they do not seem tenable. I have therefore accepted the first name used by Matsumura, which applies to species in the present group. On page 14, iii, *Entomological Magazine* (Japan), Matsumura characterized the genus fully, but many of the characters used are trivial and not constant; in this characterization the eyes are stated to be bare, but in the type species, *Syrphus lasiophthalmus* Zett., as the name implies, they are short pilose. In the second species no mention is made of the eyes. On page 16 a genus *Episyrphus* was erected for three species, including *Syrphus balteatus* DeGeer (type) and *S. cinctellus* Zett., and one species new to sci-

* Since the preparation of this paper I have concluded that the generic name *Epistrophe* Walker should be used for this group, *S. grossulariæ* Mg. bring the genotype.

ence. *Mesosyrphus* was established on page 19 for *M. constrictus* n. sp., but this genus agrees with the limits I have placed upon *Stenosyrphus*. The genus *Eusyrphus*, with *E. cingulatus* n. sp. as type, is said to be near *Mesosyrphus*, and is probably also included within the limitations which I have placed upon *Stenosyrphus*.

The genus, as accepted here, can hardly be said to be a homogenous one, and it would be a simple matter to further split it up, were it not for the fact that there are innumerable intermediate forms between any division which might be suggested. If we could eliminate from the face of the earth two or three of these species, our classification could be greatly simplified; unfortunately, our occupation calls for the unearthing of these forms and the utilization of their presence in the tracing out of the specific and generic relationships, and perhaps furthering the evidence of the natural sequence of variation and the entity of the various forms we are pleased to term species. However, Matsumura's care in selecting characters for his genera is evident, and several characters which he has used are of considerable value for the determination of specific limitations, and to some extent for the characterization of larger groups. If it is deemed wise to further divide the genera of the Syrphini it would seem to me advisable to group them as subgenera rather than give to such closely related groups generic rank.

## SYNOPSIS OF SPECIES.

1. Three principal abdominal bands separated into spots; the first pair of spots rarely obsolete ..... 2

   At least one of the principal bands entire, or no spots present except on the second segment ..... 27

2. Eyes pilose; sometimes minutely so in the female (in some specimens I have examined the eyes were disfigured and no pile apparent) .... 3

   Eyes bare ..... 6

3. The first pair of spots occupy the anterior three-fourths of the second segment, very narrowly separated, not reaching the lateral margins; face without a black stripe, but sometimes with a dash on the tubercle ..... *Ischyrosyrphus velutinus* Will.

   First pair of spots triangular or oval ..... 4

4. Face with a black stripe; abdominal spots not concave ..... 5

   Face without a black stripe but the cheeks and oral margin black; abdominal spots slightly concave anteriorly ..... *sodalis* Will.
   *contumax* O. S.

5. Pile of the metanotum usually mixed black and tawny hairs, the latter shorter; facial stripe one-third the width of the face, diffuse; cheeks of the female brownish; pile of eyes of female conspicuous, *garretti* n. sp.

   Pile of the metanotum not intermixed, either black or obscurely reddish brown in the male; facial stripe one-fourth the width of the face, less diffuse; cheeks of the female reddish yellow .... *mentalis* Will.

6. Face with a median black stripe connected with the oral margin, or almost wholly black ..... 8
   If present, the facial stripe is distinctly separated from the oral margin, 7
7. A pair of confluent yellow spots before the scutellum; side margins of the thorax yellow (*habilis* Snow) ..... *guttatus* Fall
   Without yellow spots before the scutellum; side margins of the thorax not yellow ..... *subfasciatus* n. sp.
8. Face all black, though sometimes bronzed or obscurely yellow on the sides ..... 9
   Face distinctly yellow in large part ..... 13
9. At least one pair of spots reaches the side margins ..... 10
   No spots extend over the side margins ..... 11
10. Face but little prominent below ..... *arcticus* Zett
11. Spots on the second segment absent or very small; those on the following segments narrow ..... *barbifrons* Fallen
    Spots on the second segment very distinct ..... 12
12. Second and third pairs of spots narrow, twice as long as wide.. *arcticus* Zett.
    Second and third pairs of spots wider, not twice as long as wide. *glacialis* Johnson
13. The first pair of spots do not extend over the lateral margins ..... 14
    The first pair of spots extend over the lateral margins ..... 18
14. First pair of spots absent or roundish ..... 15
    First pair of spots oval or elongate ..... 16
15. Face broadly clear yellow on the sides; spots of the second segment rarely conspicuous; abdomen more elongate, the spots paler yellow, *columbiæ* n. sp.
    Face usually with a more or less bronze reflection; spots of the second segment usually distinct; abdominal bands sometimes broader; shorter species ..... 11
16. No black or metallic blue area on or before the jowls ..... 25
    Jowls or a stripe before them black or metallic blue ..... 17
17. Jowls and oral border metallic blue ..... *pullullus* Snow
    Jowls obscurely blackish or yellow; often black before the jowls; abdominal spots usually more whitish ..... *umbellatarum* Schiner
18. The second and third pairs of spots separated from the lateral margins ..... 19
    The second and third pairs of spots extend over the lateral margins... 26
19. First pair of spots roundish ..... *arcticus* Zett.
    First pair of spots elongate, subtriangular or quadrate ..... 20
20. First pair of spots in both sexes large and squarish, very narrowly separated in the female; the third pair of spots in the male usually almost touch the side margins ..... *fisheri* Walton
    First pair of spots not squarish, the third band distinctly separated from the side margins ..... 21
21. First abdominal segment bright metallic blue ..... 22
    First segment blackish green; not metallic blue ..... 23
22. The first pair of spots occupy at least the anterior half of the segment; scutellum chiefly white pilose; tubercle not nearly as prominent as the antennal prominence ..... species, Europe
    First pair of spots not half as wide as the segment; pile of the scutellum almost all black and longer; tubercle almost as prominent as the antennal prominence; face less thickly dusted ..... *pullullus* Snow

23. Frontal transverse pollinose band rather narrow; abdominal spots very pale yellowish or creamy.....*umbellatarum* Schiner

Frontal pollinose band broad; abdominal bands yellow..... 24

24. Base of the arista distinctly more slender than the basal third, *remotus* n. sp.

Base of the arista as stout as at the basal third.....*diversipunctatus* n. sp.

25. Front and first abdominal segment with a metallic blue reflection, *umbellatarum* Schin.

Front and first abdominal segment black or bronzed; cheeks black before the jowls; male.....*diversipunctatus* n. sp.

26. Front without pollinose crossband, although there is a slight indication of one.....*nudifrons* n. sp.

Pollinose crossband moderately broad, yellowish grey or ocher, *albipunctatus* n. sp.

27. Face entirely black, the sides usually considerably bronzed; abdomen with entire reddish crossbands on third and fourth segments, *insolitus* Osburn.

Face not entirely black; if so only two abdominal spots present..... 28

28. Only two spots present (on the second segment)..... 29

At least four spots or two bands present..... 30

29. Spots on the second segment oval or roundish.....*gracilis* Coq.

Spots on second segment elongate, pointed inwardly...**bimaculata* Lovett

30. Second abdominal segment without yellow spots; bands on the third and fourth segments entire (=*rubripleuralis* Curr), *diversifasciatus* Knab

Second segment with spots or bands..... 31

31. First and third bands interrupted, the second entire; bands not reaching the lateral margins, although the first may do so in the female; cheeks and oral margin black; no median black stripe, *invigorus* Curran

Third band not interrupted, but often deeply excised and appearing so.. 32

32. Second band broadly interrupted, the third excised about half way through .....*conjunctus* var.?

Second abdominal band entire..... 33

33. Second and third abdominal bands almost, but not quite interrupted; face with a black stripe.....*conjunctus* Osburn

Second and third abdominal bands continuous, though possibly emarginate ..... 34

34. Abdomen unusually long and slender, the bands broad and extending over the margins in their full width; scutellum largely black pilose; cheeks of male rarely blackish; in female fifth segment almost half as long as the fourth (=*diversipes* Macquart).....*cinctellus* Zett.

Abdomen less elongate; fifth segment of female shorter..... 35

35. Face without a median black stripe; abdomen narrow, not oval or elliptical; bands do not extend over the margins; scutellum all pale haired .....*cinctus* Fallen

Face with or without a black stripe; abdomen oval or elliptical..... 36

36. Face with a median black stripe; rarely reduced to a dash on the upper side of the tubercle; smaller species, rarely over 8 mm..... 37

Face without a median black stripe, although the tubercle may be fuscous; larger, over 10 mm..... 45

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* This species is probably a true *Syrphus*.

37. Antennæ wholly black; never obscurely reddish beneath the third segment ..... 38
Antennæ at least reddish beneath the third segment..... 39
38. Wings distinctly pale brownish; ventral spots elongate.....*vittiger* Zett.
Wings almost hyaline, ventral spots broadly triangular or transverse, *lineola* Zett.
39. Venter without transverse or longitudinal blackish markings..... 40
Venter with distinct black markings..... 41
40. Facial stripe rather broad, reaching practically to the base of the antennæ .....*insolitus* Osburn
Facial stripe narrower, ending half way between the antennæ and tubercle .....*rectoides* Curran
41. Ventral markings in a median longitudinal line; in the male the facial stripe does not reach the antennæ.....*rectoides* Curran
Ventral markings transverse ..... 42
42. Facial stripe half the width of the face.....*insolitus* Osburn
Facial stripe narrower ..... 43
43. Hind femora of the male reddish on the basal half.....*melanderi* n. sp.
Hind femora of the male black at the base..... 44
44. Hind femora of the female black at the base; ventral transverse bands with anterior triangular projections.....*quinquilimbatus* Big.
Hind femora of female reddish at the base; ventral bands without triangular median projections .....*genualis* Williston
45. Antennæ wholly black ..... 46
Antennæ partly or wholly reddish..... 47
46. Abdominal crossbands yellow or reddish.....*grossulariæ* Meigen
Abdominal crossbands metallic, rarely obscurely reddish, *grossulariæ-melanis* Curran
47. Front of female yellow on about the lower third.....*terminalis* n. sp.
Front not yellow, except narrowly above the antennæ in the female... 48
48. Jowls more or less, or a spot in front of them, blackish; antennæ often brownish above; face more prominent; scutellum often with some black pile; hind femora of male largely black..... 49
Jowls and antennæ wholly reddish; face less prominent; hind femora wholly reddish; scutellum never with any black pile, *xanthostomus* Will.
49. The black of the jowls and cheeks in the male does not reach as high as the anterior mouth edge, but ends at the oral angles; front longer and narrower in the female; pollen of the front whitish on the sides .....*submarginalis* n. sp.
The black extends as high as the anterior mouth edge; front of female shorter and wider, with rusty pollen on the sides.....*imperialis* n. sp.

NOTE.—*Syrphus oronoensis*, *Xanthogramma tenuis*, etc., are not included, as there are two or three closely related species, but I am not sure of their identity. Jones has also recorded *triangulifer* Zett? which also belongs to this group. An examination of the types and comparison with European species will be necessary to untangle these species. Other species may have been omitted from the key, but I have tried to include all the species known.

## 53. *Stenosyrphus terminalis* n. sp.

(Plate VI.)

Face and cheeks wholly reddish yellow; oral angles produced almost as far forward as the anterior oral tip; sides of the fourth and fifth abdominal segments narrowly yellow.

Length, 11 mm.

*Female.* Face, cheeks and an arch on the front above the antennæ shining reddish yellow, somewhat translucent; sides of the face very narrowly yellowish pollinose; pile not abundant, pale yellowish. In profile almost perpendicular between the antennal prominence and the tips of the oral angles; the tubercle large, roundish and occupying almost half the length of the face, rather sharply and shortly concave between the tubercle and oral margin; produced a little downwards. Front on the upper three-fourths shining greenish black, with a yellowish pollinose brassy-appearing arch about the middle; somewhat swollen, the transverse impression almost obsolete, but visible in some lights. Pile thick, black. Posterior ocelli remote. Occiput yellow on the lower half, blackish above, densely greyish yellow pollinose; behind the posterior angles of the eyes the pollen is somewhat golden; pile of the occiput rather silvery below, yellow above, the ciliæ yellow. Antennæ orange; darker above; third segment about one and one-half times longer than broad, its end evenly rounded. Arista brownish, almost or quite as long as the antenna; moderately thickened and tapering.

Thorax aëneous, the pleuræ largely diffuse pale yellowish. Pile straw yellow; paler on the pleuræ, more condensed on the sides of the dorsum. Scutellum wholly yellow, with a slight bluish reflection, its pile wholly yellow.

Legs wholly reddish yellow, the posterior tarsi somewhat darkened apically.

Wings pellucid hyaline, the stigma and subcostal cell yellow; costal cell paler yellow. The third longitudinal vein ends just before the tip of the wing. Squamæ pale yellow, with yellow border and fringe. Halteres pale yellow.

Abdomen subshining black, the first and last segments metallic; with five yellow bands, the first interrupted. First segment at the sides and anterolaterally; sides of the second segment broadly on the anterior half and the extremely narrow margin of the apical half, and the narrow lateral margins of the fourth and fifth segments reddish yellow. Spots on the second segment moderately separated, their inner ends rounded, laterally, reaching the margin in their full width; situated about the middle of the segment. The band on the third segment occupies about the anterior half; narrowly separated from the anterior margin in the middle and at the sides, a little more so between these points; extending over the side margins in nearly its full width. Band on the fourth segment similar. The fourth band is composed of the yellow on the posterior margin of the fourth segment and the yellow, transverse anterior angles of the fifth; the reddish end of the fifth segment constitutes the fifth band. This leaves the black of the fifth segment as a broad, slightly arched incomplete band. The pile on the base of the abdomen and on the yellow bands is yellow or fulvous, longer basally; elsewhere it is black. Ventrally there appears to be a narrow median dark streak on the fourth and fifth segments and obscure spots on the sides of the second and third segments.

Holotype, female; Ottawa, Ontario; May 6, 1921 (J. H. McDunnough); in the Canadian national collection, Ottawa.

Distinct from allied species in the produced oral angles, reddish lower portion of the front and the wholly yellow-haired scutellum, etc.

## 54. *Stenosyrphus imperialis* n. sp.

(Plate VI.)

Cheeks black or blackish in both sexes; all the tarsi of the male black; venter with blackish markings; no ventral markings in the female; front black to opposite the base of the antennæ.

Length, 10 to 12 mm.

*Male*. Eyes bare. Face shining reddish yellow, the cheeks and oral margins to above the tip of the oral opening deep shining black; in some lights a bluish reflection on the face; scarcely noticeably yellowish pollinose along the eyes; pile black, but yellowish towards the middle. Tubercle large, nose-shaped, rather conspicuously concave between the tubercle and antennal prominence; anterior oral margin scarcely prominent, on a plane with the lowest portion of the facial concavity. Frontal triangle shining greenish black, densely covered with yellowish pollen except above the antennæ; the W reddish or yellowish; pile black. Vertical triangle rather brassy, with black pile. Occiput greyish yellow pollinose, with rather fulvous or yellow pile, the ciliæ black. Antennæ reddish, more or less darkened above, third segment suboval, its apex evenly rounded. Arista piceous to black, gradually tapering, almost as long as the antenna.

Thorax rather brassy aëneous, the pectus darker. Pile fulvous, more condensed at the sides. Scutellum honey yellowish, with a bluish reflection in some lights, the base and angles blackish; pile long, almost all black, only a few yellow hairs basally.

Legs red or reddish yellow; basal third of the anterior four femora and two-thirds of the hind ones, usually a band just behind the middle of the hind tibiæ and all the tarsi, black, the latter rarely brown.

Wings more or less luteous; stigma, costal and subcostal cells luteous. The third vein ends just before the tip of the wing. Last section of the fourth vein curved subbasally and subapically. Squamæ pallidly yellowish tinged, with yellow border and fringe. Halteres yellow.

Abdomen opaque black, with the margins, tip of fourth and the fifth segments, shining. First segment dull, rather olivaceous, the sides not yellow. Second segment with a pair of large, broadly separated, subtriangular yellowish red spots, their inner ends rounded or subrounded, their anterior outer corner stretching forward to the anterior angles of the segment; posteriorly they are separated from the lateral margin by about half the width of the spot. Band on the third segment entire and somewhat undulated, as it closely approaches the anterior margin at its middle and quite reaches it at the sides, well separated from it between these points; posteriorly it is notched in the middle, convex laterally, extending over the side margin in not more than half its width. Band on the fourth segment similar. Tip of the fourth segment reddish. Fifth segment wholly reddish except a median roundish or transverse spot. Pile conspicuous, long yellow basally and on the yellow bands; sometimes fulvous; shorter on the yellow bands; on the black areas and apical segments, black. Venter with triangular or oval black markings on the posterior median portion of the second and third segments and black patches on the membrane opposite.

*Female*. Pile of the face white, except on the upper angles; jowls and

cheeks blackish. Front greenish black to opposite the base of the antennæ, the W yellow. Across the middle there are indications of a yellow pollinose band, the pollen distinct laterally. Pile black. Pile of the occiput white below, fulvous above.

Sides of the dorsum or the thorax, postalar calli and pleuræ more or less, obscure reddish.

Legs reddish yellow; hind femora beyond the middle, and their tibiæ beyond the middle, with a narrow fuscous band. Hind tarsi brown, the three middle segments of the anterior four tarsi fuscous. Wings hyaline.

Abdominal bands narrower, yellow. Spots on the second segment less widely separated and more pointed medianly. Tip of the fourth segment yellow in the middle; fifth segment with a narrowly interrupted basal yellow band. Sides of the following segments yellow. Venter unicolorous.

Holotype, male, Abitibi Region, Northern Quebec, September, 1915 (Doctor Cook), in the Canadian National collection. Allotype, female, Winnipeg, Man., 1921, in the author's collection. Paratypes: male, Macdiarmid, Ontario, June 10, 1921 (N. K. Bigelow), in the Ontario Museum, Toronto; male, Mount Rainier, Washington, Paradise, 1921 (A. L. Melander), in Doctor Melander's collection.

Readily distinguished in the male by the black ventral spots, black tarsi, etc.; in the female by the somewhat swollen, chiefly black front and darker median tarsal segments (this character may not be constant). The front is shorter than in *submarginalis*.

### 55. *Stenosyrphus submarginalis* n. sp.

(Plate VI.)

Venter unicolorous; cheeks black only as high as the oral angles; first posterior cell very long and narrow; front of female narrow and laterally pollinose to above the middle; legs of the female pale, only the hind tarsi reddish or fuscous.

Length, 10 to 13 mm.

*Male.* Eyes bare. Face very shining yellow; in the middle, especially on the tubercle, broadly reddish brownish tinged. Cheeks shining black only up to the oral angles, but just behind along the occiput and below the eye, somewhat reddish. Tubercle large, sharply rounded below, scarcely concave between its tip and the antennal prominence, the oral margin on a plane with the antennal prominence. Pile on the face and cheeks yellow, black on the upper angles of the former. Frontal triangle rather metallic pale greenish beneath the yellowish pollen; in the middle shining piceous or brownish, the W paler colored. Pile black. Vertical triangle olivaceous black with short black pile. Anterior ocellus a little remote. Occiput shining greenish black with white or silvery pollen; with silvery pile below, yellow pile above, the ciliæ black. Antennæ red, very slightly darkened above, the third segment oval. Arista slender, reddish.

Thorax brassy greenish, with four obscure bronze or purplish stripes; pectus black. Pile fulvous, more condensed on the sides of the dorsum. Scutellum translucent yellowish, the base narrowly blackish; pile wholly yellow, or intermixed with black hairs apically.

Legs reddish yellow, the basal quarter of the anterior four femora and a

little over half of the hind ones, and the hind tarsi, black. Hind tibiæ with a postmedian fuscous band, which appears to extend to the apex on the posterior outer side.

Wings moderately yellowish, the stigma and subcostal cells luteous. The third longitudinal vein ends just above the tip of the wing; first posterior cell long and narrow apically, the last section of the fourth vein almost straight. Squamæ yellow, with yellow fringe. Halteres pale yellow.

Abdomen opaque black; side margins, apex of the fourth, and whole of the fifth segments, shining. First segment subshining greenish, the sides obscurely yellow. Second segment with a pair of large, subtriangular yellow spots, their outer ends stretching forwards to the anterolateral margins; posteriorly they are separated from the margin, but reach it about the middle of the segment. The complete band on the third segment is moderately separated from the anterior margin, but reaches it just at the outer angles; in the middle with an anterior triangular projection; an excised notch of the same size posteriorly; the frontal and posterior margins of the band almost straight and parallel. Band on the fourth segment similar but narrower and not so deeply notched. Both bands extend obscurely over the lateral margin on not more than their anterior half. Fourth segment rather broadly but incompletely reddish at the apex. Fifth segment reddish, with a complete black arch. Abdominal pile reddish yellow, longer basally, black on the black areas and on the caudal portion.

*Female.* Cheeks usually blackish before the jowls and on the front of the jowls. Face moderately thickly whitish yellowish pollinose except on the tubercle and cheeks. Front long, moderately narrow, the sides yellow pollinose on the lower two-thirds, the pollen not expanding above. In color the front is shining greenish black; the facial ground color extends up beyond the base of the antennæ and leaves a blackish projection downwards just above them, the red W with a narrow, incomplete black W above it. Anterior ocellus not remote. Face with yellow, the front with black pile. Occiput white pollinose below, becoming yellowish above; pile white below, light yellow above.

Sides of the dorsum of the thorax and the pleuræ more or less reddish yellow; the latter moderately whitish pollinose.

Legs wholly reddish yellow; hind tarsi somewhat fuscous. Squamæ white, with whitish fringe. Halteres yellow.

First abdominal segment yellowish laterally, and sometimes narrowly so in front, the ground color elsewhere metallic bluish or greenish black. Abdominal bands all narrower than in the male; not differing in shape.

Holotype, male; Orillia, Ontario; May 20, 1921; in the author's collection. Allotype, female; Orillia; May 18, 1921; in the Canadian national collection, Ottawa. Paratypes, five females; Orillia; May 5 to June 30; all collected by the author.

This is the species upon which I recorded *Syrphus nitidicollis* as North American, and while it is remarkably similar superficially the two are very widely separated. One female was also recorded as *Syrphus ochrostomus* but this species is also a true *Syrphus* and quite different. I have seen specimens of *Syrphus nitidicollis* from British Columbia and Washington.

### 56. *Stenosyrphus melanderi* n. sp.

Very similar to *rectoides* and *genualis*, etc., but the hind femora of the male are yellow on the basal third.

Length, 8 mm.

*Male*. Face orange yellow, with a deep bluish opalescence on the sides; cheeks, oral margin and a narrow median facial stripe, reaching to the upper fourth, shining deep bluish; sides of the face narrowly yellow pollinose. Pile black. In profile, a small swelling below the antennæ, thence shallowly concave to the rounded tubercle, which does not reach as far forward as the antennal prominence; below the tubercle rather shallowly concave to the oral tip. Frontal triangle metallic bluish or bluish green, the ground color obscured, except just above the antennæ, by greyish yellow pollen; the W bright yellow; pile black, moderately long. Vertical triangle very long, olivaceous, black pilose except at the vertex; anterior ocellus a little remote. Occiput, except behind the mouth, black, with greyish yellow pollen and white or silvery pile; the pile fulvous or bright yellow on the upper fourth. Antennæ brownish, reddish beneath; third segment short oval. Arista brown, longer than the antenna.

Thorax aëneous, the dorsum moderately shining, somewhat olivaceous; pile reddish yellow, more fulvous on the sides. Scutellum yellow, its base not black; with rather thin, long black pile, but some light colored hairs basally.

Legs red; coxæ, bases of the anterior four femora, a broad band occupying more than the apical half of the hind femora, but not the apex, and the hind tibiæ and tarsi beyond the basal fourth of the former, black or brown; bases of the hind tibiæ brownish red.

Wings very slightly luteous, especially anteriorly. Stigma luteous. The third longitudinal vein ends in the tip of the wing. First posterior cell subacute. Squamæ pale yellowish, with yellow border and fringe. Halteres yellow.

Abdomen slightly shining deep black, the second segment opaque on the disc. First segment with a greenish reflection. Second segment with a pair of large, subtriangular yellow spots; broadly separated from the lateral margin posteriorly, the outer end carried obliquely forward so that it reaches the anterior margin at the lateral corners; the spots are placed decidedly obliquely and are rather widely separated from each other. Third segment with a broad, continuous yellow band, which is attenuated laterally, so that it goes over the margin rather narrowly anteriorly; broadly notched in the middle behind; wholly narrowly separated from the anterior margin of the segment. Fourth segment with a similar but slightly narrower, less deeply notched band; the end of the segment also yellow. Fifth segment with the apex, sides and anterior angles yellow. Pile on the basal segments and where the yellow bands reach the margins, rather long, yellowish; shorter yellow on the principal yellow bands; on the second behind the yellow spots and on the remaining black areas, black; short on the disc, rather long on the margins.

Holotype, male; Mount Constitution, Washington; July 22, 1919 (A. L. Melander); in the collection of Doctor Melander.

### 57. *Stenosyrphus nudifrons* n. sp.

Frons entirely deep blue black, not at all pollinose; cheeks and median facial stripe black, the former brownish or reddish behind; abdomen with three pairs of straight, rather narrow yellow bands which extend over the side margins in half their width.

Length, 8 mm.

*Female*. Face and posterior mouth edge bright shining yellow; a broad median stripe, narrowing above and not quite reaching the antennæ, the oral margin and the cheeks before the jowls, shining black; the jowls brownish or reddish. Face without pollen; pile of the face and cheeks extremely short, white. Tubercle long, nose-shaped, reaching a little more forward than the antennal prominence. Front, to the lower margin of the insertion of the antennæ, deep blue black, the antennæ inserted on yellow ground; the W reddish or yellow. Posterior ocelli a little remote. Pile short, black. Occiput metallic dark bluish; densely covered with greyish pollen except on the upper part; with silvery white pile, which becomes faintly yellowish above. Antennæ black, reddish below the base of the third segment; third segment oval, its end almost evenly rounded; nearly twice as long as wide. Arista a little longer than the third segment; thickened on its basal three-fourths.

Thorax shining black, the pleuræ and the sutures laterally, a little brassy. Postalar calli with a reddish point at each end. Pile wholly short, fine, white, longer on the pleuræ. Scutellum brownish yellow, its base and sides black; pile black on the apical half, pale basally.

Femora black; apical half of the anterior four and apices of the hind ones, reddish; anterior four tibiæ and tarsi reddish, the tarsi darker apically. Hind tibiæ and tarsi brownish, the base of the tibiæ obscurely reddish.

Wings faintly yellowish; stigma and subcostal cell luteous. The third longitudinal vein ends quite in the tip of the wing. Squamæ white, with pale yellow border and whitish fringe. Halteres yellow.

Abdomen deep black, shining, with three pairs of moderately separated slightly greenish yellow, transverse spots, their inner ends obtusely rounded, the spots gradually narrowed towards the lateral margins, the anterior ones less so. First pair of spots near the middle of the second segment; second and third pairs separated from the anterior margins of the segments by nearly the width of the spots; all the spots extending broadly over the side margins. Tips of the fourth and fifth segments narrowly yellow. Pile of the abdomen short, black, but nearly all white on the margins; longer, whitish on the base of the abdomen.

Holotype, female; top of Mount Marcy, New York; June 16, 1918 (W. T. M. Forbes).

This species will be readily distinguished from all its allies by the wholly shining face and front, bare eyes and the shape of the abdominal bands. It seems to be related to *montalis* Williston.

### 58. *Stenosyrphus albipunctatus* n. sp.

(Plate VI.)

Face and cheeks creamy, the former with a median black stripe; first pair of abdominal spots large, not reaching the margin in the male, but doing so in the female; usually creamy whitish. Eyes bare.

Length, 9 to 10 mm.

*Male.* Face and cheeks creamy, the former with whitish pollen; a median stripe, evenly narrowed to its upper extremity, which is decidedly below the base of the antennæ, and the oral margin broadly as far back as the jowls, shining black, the color somewhat obscured along the oral margin by the white pollen; a small spot on the jowls touching the orbital margin, and often a diffuse area just before the jowls, brownish or blackish. In profile slightly swollen just below the antennæ, thence a little hollowed to the long, noselike tubercle, which is broad and produced a little more forward than the antennal prominence; below the tubercle concave, the tip of the oral margin produced very slightly forward below the deepest portion of the concavity. Frontal triangle shining greenish black, with a brassy reflection above, the W reddish yellow; sides narrowly yellowish pollinose. Pile on the sides of the face rather long, black; fine and white on the central slopes; long and black on the frontal triangle. Vertical triangle shining greenish black, with short black pile. Ocelli equidistant. Occiput with greyish pollen; on the lower three-fourths with silvery pile, above with yellow pile, but chiefly black at the vertex. Antennæ deep black; third segment rarely obscurely reddish just at the base beneath, sometimes more brownish in color; its shape oval. Arista black; not quite as long as the antenna.

Thorax metallic greenish black, very shining; pectus somewhat bluish; pleuræ, and usually the sides of the dorsum before the suture, densely whitish pollinose. Pile of the dorsum cinereous reddish yellow, more fulvous on the sides; white on the lower portion of the pleuræ. Scutellum translucent luteous, with a strong metallic blue reflection, the base and corners blackish; pile long, black, not very abundant.

The legs black; apical half of the anterior four femora and their tibiæ, luteous or brownish yellow, their tarsi brownish; extreme tips of the hind femora and bases of their tibiæ somewhat yellowish; pile of the legs white; some long black hairs on the back of the anterior four femora apically; a row of short, black ciliate hairs on the posterior margin of the hind tibiæ.

Wings clear hyaline; the third vein curves very slightly back to join the costa at the extreme tip of the wing; the fourth longitudinal vein joins the third at a right angle. Stigma luteous. Squamæ yellowish, with yellow fringe. Halteres brownish yellow.

Abdomen opaque black; tip of the fourth segment, the fifth wholly, and the sides of the abdomen, shining black. Second, third and fourth segments each with a pair of transverse, narrowly separated creamy or whitish spots, the first pair usually distinctly wider laterally, often much wider, situated slightly before the middle of the segment, their inner ends subtruncate, a little more rounded posteriorly; their outer ends more or less produced forwards, but not quite reaching the margin. Second and third pairs of spots separated from the anterior margins of their respective segments, subtruncate inwardly, more rounded posteriorly, their outer ends a little narrowed and sharply rounded. Apices of the fourth and fifth segments similar in color to the abdominal spots. None of the spots reach the side margins. Pile basally, and on about the anterior half of the lateral margins of the third and fourth segments, whitish or slightly yellowish, rather long; shorter, pale yellowish on the pale spots; elsewhere black.

*Female.* Usually no spot on the jowls below the eyes, the black along the mouth edge not so broad and often almost wanting; no stripe before the jowls;

pile of the face less extensively black, sometimes entirely white; facial tubercle a little less nose-shaped. Front moderately narrowed above, deep shining black, with black pile; on the sides below, expanding on the upper half of the transverse depression, and almost or quite reaching in the middle, thickly yellowish pollinose, sometimes more greyish laterally. Posterior ocelli a little remote. Third antennal segment a little larger.

Thorax with a metallic bluish green reflection; pleuræ and sides of the dorsum with more dense pollen, and the pectus is also thinly pollinose. Pile of the dorsum yellow; of the pleuræ, white. Scutellum more yellowish, the bluish reflection not so strong; pile yellow, but some black hairs on the apical portion.

Legs not differing materially in color, but wholly without black pile or ciliate hairs.

Wings similar; apical cross-vein not joining the third vein at quite a right angle. Squamæ white, with a pallid yellow border and whitish fringe. Halteres pale yellow.

First pair of abdominal spots wider; extending over the side margins in not quite their full width. Abdomen more brightly shining, subopaque, the spots frequently almost white.

Described from seventeen specimens from Washington, Idaho and British Columbia; types in the collection of Doctor Melander; paratypes in the University of Kansas museum and the collection of the author.

This species is the closest of all the members of the group to *S. umbellatarum* Schiner, but the male is at once distinguished by the narrower, seldom subtriangular first pair of spots which do not extend over the side margin, and *umbellatarum* apparently never has the base of the third antennal segment somewhat reddish below as often happens in the present species. The female is most readily separated from allied species, except *umbellatarum*, by the whitish color of the abdominal markings, and from that species by the slightly narrower first pair of spots, slightly wider front and decidedly narrower pollinose frontal band, and usually by the color of the front and first abdominal segment. The characters used in the key should prove sufficient to readily distinguish it from allied species.

I doubtfully record *umbellatarum* from a single specimen from British Columbia, but am not quite sure of my determination in this difficult group. I have four specimens of *umbellatarum* in my collection; one female from Denmark, a pair from Austria, the typical locality, and a female from Alaska. Of those from Austria the female does not agree with Verrall's nor Lundbeck's description, but the former female and the male agree in all essential particulars. I believe that the two females mentioned belong to different species; the Danish specimen was received from Professor Lundbeck, the last two from Professor Bezzi. It is quite possible that the species recorded from the northern part of Europe as *umbellatarum* is really distinct, but a large series is needed in order to determine the limits of the species.

### 59. *Stenosyrphus diversipunctatus* n. sp.

(Plate VI.)

Eyes bare. Abdomen with three pairs of yellow spots all separated from the lateral margins in the male, the first pair large; the first pair narrower, extending over the margins in the female; the male differs from *umbellatarum*

and *fisheri* in that the first pair of spots does not extend over the side margins; the female differs from allied forms in the remarkable arista, which is wholly thick on the base, and not narrower just beyond its base, as is customary.

Length, 9 to 10 mm.

*Male.* Face and cheeks yellow, with a bluish opalescence; moderately covered except the tubercle, with yellow pollen; pile black; whitish below and inwardly. Tubercle long, moderately large, but not prominent. Frontal triangle shining black just above the antennæ, the W reddish, elsewhere thickly yellowish pollinose; with a brassy reflection; pile moderately long, black. Occiput extremely narrow above; whitish pollinose; pile white, becoming almost fulvous above. Antennæ wholly black; third segment one and one-half times longer than broad. Arista black; thickened on the basal half.

Pleuræ densely greyish white pollinose; dorsum of thorax brassy or bronze black, metallic; pectus black. Pile yellowish, white on the pleuræ. Scutellum translucent yellowish, its base and sides narrowly black; pile long, yellow basally, black on the apical half.

Legs black; apical half of the anterior four femora and their tibiæ, except a narrow postmedian obscure band, dull yellow; apices of the hind femora, bases of their tibiæ and the anterior four tarsi, brownish yellow, the tarsi more brownish apically.

Wings subhyaline or hyaline; stigma and the subcostal cell partly luteous. The third longitudinal vein ends in the tip of the wing. Squamæ pale yellowish, with yellow border and fringe. Halteres yellow or luteous.

Abdomen opaque black; first and fifth segments wholly, narrow apices of the second and third, broad apex of the fourth and the whole lateral margin, shining black. Second abdominal segment with a large yellow spot lying a little before the middle, its outer end almost parallel to the lateral margins, the inner end not so broad and rectangularly rounded; outer end produced a little forward, but not nearly reaching the anterior angles; spots a little longer than broad. Second and third pairs of spots a little over half as wide as the first pair, well separated from the anterior margin of their respective segments and not reaching the lateral margins; their inner ends obtusely rounded, the outer end more pointed in front; separated from each other by half their width. Apices of the fourth and fifth segments yellow. Pile rather stout, black; short on the disc longer on the sides; on the base of the abdomen and on the yellow spots, whitish.

*Female.* Face with a similar stripe to the male, the oral margin brownish; cheeks yellow. Face shining yellow in the middle. Front much longer than its width at the antennæ, considerably narrowed above; shining black above and below, across the middle with a broad, grey pollinose band which is connected broadly along the eyes with the pollen of the face; the pollen at the very middle of the front rusty reddish. Pile of the face and occiput wholly white; on the front, black. Arista without the usual basal constriction.

Pleuræ more thickly dusted. Scutellum whitish yellow. Squamæ with white border and fringe.

First pair of abdominal spots only slightly wider than the second pair, going over the side margins in half their width. Small spots on the anterior angles of the fifth segment touching the anterior border and extending over the side margins. All the spots a little more yellowish than in the male.

Holotype, male, Orillia, Ontario, May 29, 1921; allotype, female, Orillia, September 19, 1921; paratype, male, Orillia, May 7, 1921; all collected by the author. Holotype in the Canadian national collection, Ottawa, the other specimens in the author's collection.

This species is close to *umbellatarum*, but the characters given above will readily distinguish it. I have some doubt about the female belonging here. The peculiar arista and narrower abdominal spots on the second segment would indicate a distinct species, but more specimens are necessary before definite conclusions can be reached.

It is possible that this is *Syrphus sexmaculata* Walker, but the description is so incomplete that I prefer to describe it as new in order that a better understanding of our fauna may result, rather than place it under that species. The question of synonymy appears equally divided either way.

### 60. *Stenosyrphus remotus* n. sp.

Eyes bare. Face with a median black stripe; abdominal bands all separated from the lateral margin.

Length, 8.5 mm.

*Female.* Face shining whitish yellow, the sides thinly whitish pollinose and with fine white pile; a median black stripe, widest on the tubercle, extends from the oral margin almost to the base of the antennæ, obscure above, its upper end rounded. Oral margin broadly black or brown as far back as the oral angles, the blackish stripe reaching a little beyond the oral angles but not following the oral margin. Tubercle roundish, small but rather prominent, moderately excavated above the tubercle, retreating below it. Front considerably narrowed above; shining greenish black; a polished, slightly raised somewhat kidney-shaped area above each antenna, narrowly separated from each other; the W reddish. Sides of the front rather broadly yellowish grey pollinose, broadly connected in the middle. Front with rather long black pile. Occiput greyish yellow pollinose, with whitish pile which becomes somewhat yellowish above. Antennæ black, third segment oval. Arista black, thickened on the basal half.

Thorax shining blackish green, the pleuræ and broad sides of the dorsum before the suture, the pectus less thickly, densely whitish pollinose. Pile rather reddish yellow on the dorsum, white on the pleuræ. Scutellum yellow, with a slight bluish opalescence, the base and angles blackish.

Anterior four femora black on the basal third; elsewhere reddish; their tibiæ reddish with an obscure darker band just beyond their middle, and their tarsi brownish red. Hind legs black except the reddish knees.

Wings hyaline, the stigma and subcostal cell yellowish. The third longitudinal vein ends in the tip of the wing. Squamæ white, their border yellowish, the fringe pale yellow. Halteres yellow.

Abdomen slightly shining black, with three pairs of subquadrate yellow spots, none of which reach the lateral margin. First segment and the lateral abdominal margin, metallic. First pair of spots situated before the middle of the second segment, rather truncate interiorly, the outer end a little produced forward, the spots placed very slightly obliquely. Second pair of spots narrowly separated from the anterior margin, their inner ends subtruncate, more rounded behind, their outer ends somewhat narrowed and sharply

rounded or subacute; the spots about two and one-half times as long as wide and moderately separated from each other. Third pair of spots similar. Tips of the fourth and fifth segments and a roundish spot inside the anterior angles of the latter, yellow. Pile rather pale yellow basally and on the yellow spots, elsewhere shorter, black. The ventral black bands emit a median triangle forward.

Holotype, female; Mount Jefferson, Oregon; August 17; in the author's collection.

This species is very close to *pullullus* Snow, but may be distinguished by the angular projections of the ventral transverse bands, absence of metallic blue color, etc.

### 61. *Stenosyrphus garretti* n. sp.

Eyes short whitish pilose; abdomen with three pairs of yellow spots, the first pair rather large, oval.

Length, 8 to 9 mm.

*Male.* Face shining black, a little less than the lateral third yellow, usually the whole face with a bluish reflection. The yellow on the sides extends to a little below the tubercle. Tubercle small, prominent; extending as far or a little farther forward than the antennal prominence; moderately excavated above the tubercle, a little concave and produced below it. Pile moderately long, black. Sides of the face very slightly dusted. Frontal triangle shining black, the sides narrowly yellow pollinose, the middle arm of the W yellow; pile black. Vertical triangle shining, with black pile in front and yellow or fulvous posteriorly. Eyes with very short whitish or cinereous pile. Occiput with yellowish grey pollen and yellow or fulvous pile. Cheeks bare in the middle, black pilose behind. Antennæ inserted on yellow ground; wholly dull black or brown; third segment oval. Arista black or brown.

Thorax shining black, with a metallic blue reflection which is more pronounced on the pectus; pile rather long, mixed bright yellow and black on the disc, more blackish on the margins of the dorsum. Scutellum dull luteous, the narrow base and corners black; pile long, sparse, black.

Legs black or brown; tips of the femora, anterior four tibiæ except broad, obscure bands a little beyond the middle and the basal segments of their tarsi, brownish luteous or luteous.

Wings hyaline or somewhat luteous; stigma and subcostal cells luteous. The third longitudinal vein ends in the extreme tip of the wing. Squamæ yellowish, with yellow border and fringe. Halteres obscure yellow.

Abdomen subshining black, the borders of the segments more shining. Second segment with a pair of oval or broadly oval yellow spots which do not quite reach, or are well separated from the lateral margins; the spots situated about the middle of the segment and well separated from each other. The second pair of spots are about twice as wide as the first pair, well away from the anterior margin of the segment and moderately separated from each other; their inner ends obtusely rounded, the outer narrowed and not quite reaching the margin. Third pair similar to the second, but evenly rounded medianly and almost or quite reaching the side margins. Apices of the fourth and fifth segments bright yellow; obscurely yellow spots on the anterior angles of the fifth segment, touching the anterior border. Pile chiefly long,

black, but yellow on the first segment and on the yellow spots; some yellow hairs intermixed with the black sublaterally on the second segment.

*Female.* Unusually like the male. Facial black stripe not quite one-third the width of the face; pile of the face whitish towards the middle. Front entirely shining black, although there are traces of a very narrow pollinose band; transverse depression almost evenly arched on its upper margin. At the vertex the width is three times that of the distance between the posterior ocelli. Pile wholly black. Occiput grey pollinose; pile whitish, fulvous about the vertex; occipital ciliæ black. Cheeks whitish pilose.

Pleuræ with whitish pile, the dorsum with yellow; longer black hairs on the margins and apical half.

Abdominal bands not quite so broad; the first pair going obscurely over the lateral margins; remaining spots not reaching margin; spots placed a little obliquely.

Holotype, male; Bull River, British Columbia; May 4, 1918 (C. B. D. Garrett); in Mr. Garrett's collection. Allotype, female; Banff, Alberta, Canada; June 28, 1909 (N. B. Sanson); in the Canadian national collection, Ottawa. Paratype, male; Sydney; May 6, 1906; in the author's collection.

Very close to *mentalis* Will., but distinguished by the broader facial stripe, more conspicuous tubercle, wider abdominal bands, etc.

### 62. *Stenosyrphus columbiæ* n. sp.

Eyes bare. Face with a triangular median black stripe; second abdominal segment with very small spots or none. Eyes bare.

Length, 9 to 10 mm.

*Male.* A triangular median facial stripe, reaching just to the base of the antennæ, the cheeks and broad oral margin, shining black. Sides of the face reddish yellow or orange; rather thickly dusted with white pollen, which extends across the face just below the antennæ. Pile black. Frontal triangle greenish black; thickly white pollinose; inner arms of the W reddish, so that there is nearly a complete arch above the antennæ; pile black. Vertical triangle shinning, with black pile. Occiput silvery grey pollinose; pile rather silvery, that about the vertex yellow; ciliæ numerous, long and black. Antennæ situated on a reddish or yellowish ground; deep black, the third segment often brownish. Arista black, thickened on the basal half or more, nearly as long as the antenna; third antennal segment oval.

Thorax greenish black with more or less metallic brassy or bronze reflection. Pile rather silky, on the disc of the dorsum yellow; laterally and posteriorly, black; brown on the upper portion of the pleuræ, yellow below. The pile is variable, as it may sometimes be somewhat whitish rather than yellow, and the black may be more or less extensive than described. Scutellum obscurely reddish or brownish on the disc; with long black pile apically, usually yellowish basally, but varying, so that it may be intermixed, but always chiefly black apically.

Legs black; knees narrowly reddish; tarsi brownish.

Wings cinereous hyaline; stigma and subcostal cells luteous. The third longitudinal vein ends in the tip of the wing. Squamæ white, with yellow border and fringe. Halteres brownish, the stem usually paler.

Abdomen shining on the margin, the disc of each segment more or less

opaque; at least less shining than on the margins. Second segment usually wholly without distinct yellow spots, but usually there is a slight trace of a lighter area; often a pair of very small, oval or roundish spots near the sides at the middle of the segment. Third segment with a pair of broadly separated, narrow yellow spots, which are well separated from the lateral margins and obtusely pointed at either end. Spots on the fourth segment very similar, but their outer end is broader than their inner and they are sometimes not sharply outlined. Apices of the fourth and fifth segments narrowly and incompletely yellow.

Holotype, male; Chilcotin, British Columbia; May 2, 1920 (E. R. Buckell); in the Canadian national collection, Ottawa. Paratypes; three specimens, same data; twelve specimens, Cranbrook, B. C. (C. B. D. Garrett); specimen, Chehalis, Washington; May 17, 1911.

Near *arcticus*, but at once distinguished by its more slender form, more elongate abdomen, color of the head, etc.

### 63. *Stenosyrphus subfasciatus* n. sp.

Abdomen with three pairs of yellow spots which extend over the side margins in at least half their width, the spots widest in the middle; narrowly separated from each other in the female, moderately so in the male; cheeks and oral margin black; face yellow; usually with a brown streak on the upper portion of the tubercle.

Length, 9 to 10 mm.

*Male*. Face shining yellowish, in the middle reddish yellow, on the sides with a metallic luster. Oral margin narrowly, and the cheeks shining black; jowls somewhat fuscous; above the tubercle a slender median brown streak. Pile of the face wholly black, moderately long on the sides. Face, in profile, slightly concave between the antennal prominence and the tubercle, the latter more prominent than the former; with a pinched appearance when viewed from in front; anterior oral margin close to the tubercle; antennal prominence not at all conspicuous, not produced, only a little rounded. Frontal triangle greenish black, more or less brassy, the sides and apex thinly yellowish pollinose; pile moderately long, black. Vertical triangle greenish black, with black pile. Occiput greyish pollinose, becoming yellow about the middle; shining greenish black above; with white pile below and on the back of the jowls, fulvous pile on the upper half; occipital ciliæ numerous, long, black. Antennæ wholly dull black; third segment rectangularly oval; arista thickened on the basal half.

Thorax metallic brassy greenish, the pectus blue. Pile of the dorsum and pleuræ long, fulvous; on the sides of the dorsum and on the posterior half of the pteropleuræ, longer, black, but there are still some fulvous hairs intermixed. Scutellum luteous yellow, with a slight bluish reflection; with long, not dense, black pile.

Legs reddish yellow; basal fourth of the anterior four femora, the hind ones except the broad apex, a broad preapical band on the hind tibiæ, or all except the broad base, and the hind tarsi, black, brown or fuscous; rarely only slightly darker.

Wings cinereous hyaline; stigma luteous, the subcostal cell pallidly so. The third longitudinal vein ends in the tip of the wing. Squamæ pale yellowish with yellow border and fringe. Halteres yellow.

Abdomen slightly shining black, the sides strongly shining. First segment greenish black, never bluish. Second segment with a pair of large, broadly separated oval or suboval spots, placed somewhat obliquely, as their outer end is decidedly nearer the front margin of the segment, and is usually produced in over half the width of the spot to the lateral margin, or almost so, but the yellow never runs forward to the anterior margin. These spots are not wider than the following pair. The spots on the third segment are moderately separated from each other and from the anterior margin of the segment; inwardly they are subtruncate and are usually widest about the inner third or fourth, after which they are gradually narrowed posteriorly so as to go over the margin in at least half their width; they are usually widened again on the curled under margin. Spots on the fourth segment similar, but slightly narrower, usually a little less narrowed before the margin. Apex of the fourth segment completely, narrower usually incomplete apex of the fifth, and linear, triangular spots on the sides of the fifth segment, yellow. The abdominal spots may vary from yellow to orange yellow. Pile long, yellowish basally, but even here it may be largely mixed with black, or almost all black; side margins with long black pile, but yellow opposite the yellow spots; pile on the disc yellow basally, but beyond the first pair of spots follows the ground color, and is short and more sparse.

*Female.* Oral margin usually bronze fuscous; cheeks, to before the jowls, usually of the same color, but sometimes of this color only along the eyes or a spot on the jowls. Facial stripe usually absent, the face a little more concave above; pile whitish on the slopes. Front shining black; on the sides below and moderately narrowly across the middle, thinly greyish or brownish grey pollinose, often scarcely obscuring the ground color. The arch above the antennæ is not incised medianly. Front moderately narrowed above; wholly black pilose. Anterior ocellus very slightly remote. Third antennal segment brownish.

Pile of the dorsum of the thorax yellowish; of the pleuræ, whitish; pleuræ thinly dusted with white. Scutellum pale haired on the basal half or less.

Legs variable as in the male; squamæ white, with yellow border and fringe.

Abdominal bands usually more parallel-sided and a little narrower, but sometimes almost as in the male; the spots on the anterior angles of the fifth segment are less elongate and the tip of the fifth segment is completely narrowly yellow.

Eighteen specimens of both sexes, from Alberta, British Columbia, Washington and Idaho. Holotype in the collection of Doctor Melander; allotype in the Canadian national collection.

This species will be readily recognized by the pinched face and the streak on the upper side of the tubercle, and the shape of the abdominal spots is very characteristic.

### 64. *Melanostoma confusum* n. sp.

(Plate VII.)

Very much like *M. obscurum,* but smaller; the face less thickly and more evenly pollinose and less produced; abdominal crossbands in the female decidedly different.

Length, 6 to 6.5 mm.

*Male.* Face shining blackish green, very thinly whitish pollinose, so that

the ground color is scarcely obscured; sides almost parallel; in profile, a little concave above, the tubercle long, somewhat nose-shaped, between the tubercle and the tip of the oral margin triangularly excavated; the oral margin more prominent than the antennal base, but less so than the tubercle. Sides of the face with blackish pile. Front bronzed, subopaque, with black pile. Vertical triangle prominent, black, its pile black. Occiput very thinly pollinose, with black pile; below and on the cheeks, the pile whitish yellow. Antennæ black, third segment brown, reddish below; almost twice as long as broad, its end evenly rounded. Arista luteous, about as long as the antenna.

Thorax and scutellum greenish black, with a slight brassy reflection. Pile rather long, black; some yellow hairs on the pleuræ.

Legs black; anterior four basitarsi, tips of all the femora, anterior tibiæ, except a broad obscure band, and the middle tibiæ except a broad brownish band, reddish yellow or luteous. Anterior tibiæ with five or six, the middle with six or seven ciliate hairs on the posterior margin; anterior femora with fine, ciliate black pile posteriorly; hind legs with light-colored pile; tarsi with yellow pads.

Wings lightly cinereous, the first posterior cell less obtuse apically than in *obscurum*. Squamæ light brown, with brown fringe. Halteres fuscous.

Abdomen opaque black, with three pairs of bronze spots. First segment, except in the middle, abdominal side margins wholly, and the fifth segment, bronzed. On the second segment the bronzed margins are broader anteriorly and a little more dilated behind the middle; on the anterior corners of the third and fourth segments the spots formed by the dilatation of the margin are large, triangular, broadly separated in the middle, and reaching at the sides to about the apical third of the segment. Pile of the abdomen dilutely luteous on the base and metallic areas; elsewhere, short, inconspicuous, black. While the pile at the sides is long, there are no ciliate hairs.

*Female*. Face a little more concave above, the tubercle broader and more rounded. Front slightly narrowed above (decidedly broader than in *obscurum*), its pile all black. The pollen on the lower part of the face is slightly rippled, the pile inconspicuous, white; pile on occiput, vertex and cheeks white. Antennæ more extensively yellowish, sometimes all yellowish or reddish except above.

Squamæ white, with pallidly yellow fringe. Halteres yellow.

Metallic spots of the abdomen usually aëneous, but sometimes there is a distinct reddish cast. On the second segment they are large and join in the middle to form a complete shining band, the opaque extending only two-thirds the distance forward; on the third and fourth segments the opaque is reduced to a posterior, incomplete, narrowly interrupted fascia, its anterior margin somewhat arched.

Holotype, male, Orillia, Ontario, May 5, 1921; allotype, female, Orillia, Ontario, May 17, 1921; in the Canadian national collection, Ottawa. Paratypes: Two males, Orillia, April 28; eight females, Orillia, May 5 to 29, all collected by the author; female, Malaga, New Jersey, April 26, 1918 (A. Nicolay). Paratypes in the Kansas University Museum and the collections of Dr. Melander and the author.

This species was fairly common in the vicinity of Orillia in the early spring, but not recognizing it as distinct I neglected to capture more specimens. It

occurs in clearings in woods among weeds and spring flowers, especially near swamps. Some of the specimens were taken on bloom of Spring Beauty.

### 65. *Melanostoma atra* n. sp.

(Plate VII.)

Face produced; front moderately broad; thorax aëneous; abdomen cupreous bronze; wings luteous.

Length, about 9 mm.

*Female.* Face and lower part of the front bright blackish green, the former, except a stripe extending from the oral margin to the upper end of the tubercle, and the cheeks, thinly covered with greyish white pollen; in profile, considerably produced below, the tubercle long and narrow, the oral margin slightly more prominent than the tubercle. Facial pits slender and deep, extending almost to the lower border of the tubercle. Front considerably narrowed to the middle, much less so above; on the sides below pollinose like the face; below the middle with a distinct, shallow transverse depression which is broader laterally; just above the antennæ somewhat swollen. Above the depression the color is somewhat brassy. Sides of the facial slopes, side margins and cheeks, with sparse, very short white pile which is rather inconspicuous; front with cinereous pile, whitish pilose across the middle; occiput with whitish pollen and longer whitish pile.

Thorax aëneous, the dorsum and scutellum rather strongly brassy. Pile very short, subappressed, yellowish.

Legs reddish; basal third or less of the anterior four, two-thirds of the hind femora, a band beyond the middle of the hind tibiæ, and the hind tarsi except the articulations, black; obscure dark bands on the remaining tibiæ. Anterior tarsi brownish, except basally.

Wings luteous, less so posteriorly and apically. Apical cross-vein somewhat sinuous, not rising at a right angle, but joining the third longitudinal vein at right angle. Squamæ whitish, with pale yellow border and fringe. Halteres yellow.

Abdomen brassy cupreous. Pile very short, subappressed, yellow; erect and longer basally and laterally. Venter cupreous; incisions not yellow in the type.

Holotype, female; Colorado; in the Kansas University Museum.

This species is near *luteipennis,* but is readily distinguished by the more produced face, more slender form, etc.

### 66. *Melanostoma luteipennis* n. sp.

(Plate VII.)

Front broad, without a complete pollinose cross-band; thorax and the broad abdomen wholly shining, with a brassy reflection; femora rather stout; wings decidedly longer than the abdomen, tinged with luteous.

Length, 9.5 to 10 mm.

*Female.* Face and front greenish black, the former, except the tubercle and cheeks, thinly dusted with greyish or yellowish grey pollen; in profile almost perpendicular to the narrow, elongate tubercle, which is just a little more prominent than the oral margin; lower part of the face moderately projecting;

cheeks broad, extending well below the eyes. Facial pits not deep, extending only to the lower border of the tubercle. Front broad, about one and one-half times wider at the antennæ than at the vertex, below the middle with a distinct shallow transverse depression which broadens out on the sides; sides narrowly opposite the antennæ, more broadly on the depression, pollinose like the face. The swelling of the ocellar triangle reaches to the vertex. Pile of the front black or fuscous; yellow or tawny across the middle; of the occiput whitish; of the face, short, fine, whitish. First two antennal segments shining black; third brown, reddish yellow at the base below, about one and one-half times as long as broad, elongate oval, the upper margin flattened; arista luteous, not stout, a little longer than the third segment.

Thorax greenish black, the dorsum, upper part of the pleuræ and the scutellum with a strong brassy or cupreous reflection. Pile short, yellow.

Femora on about the basal two-thirds shining black; apices of the femora, tibiæ except an obscure, on the hind ones distinct, black band, and the middle basitarsi, reddish; tarsi reddish fuscous or fuscous, rarely the anterior four almost reddish.

Wings luteous, paler apically and towards the posterior border. Apical cross-vein sinuous, rising at a right angle and joining the third longitudinal vein in one; first posterior cell more obtuse than usual. Squamæ white, with scarcely yellowish fringe. Halteres orange or orange yellow.

Abdomen wholly peculiarly brassy cupreous; elliptical in shape. Pile subappressed, yellowish white; longer and erect basally. Venter greenish black, the incisures more or less reddish; pile yellow.

Holotype, female, Pullman, Wash.; June 6, 1918 (A. L. Melander), in the collection of Doctor Melander. Paratypes, one female, same data; three females, Pullman, May and June. Paratypes in the Kansas University museum and the collection of the author.

This species is close to *rufipes* Williston, but is readily distinguished by the shape and color of the abdomen, darker legs, etc. It is distinguished from *parvus* Williston and *chilosia* Curran by its larger size, luteous wings and obtuse first posterior cell. From *atra* it is distinguished by its less prominent face, color, broader abdomen, etc.

## GENUS PYROPHÆNA Schiner.

### 67. *Pyrophæna granditarsis* var. *apicauda* n. var.

First two abdominal segments similar in color to the typical form; third to fifth segments yellowish red; the lateral margins, sometimes more broadly behind, narrow posterior margins of each segment and sometimes a median longitudinal stripe on the posterior third of the third and fourth segments, black or the lateral margins of each segment may be only brassy.

Holotype, male; San José, Cal., April 10, 1896. Paratype, same data; in the collection of Doctor Melander.

There appears to be no difference in structure between this and the typical form, and therefore no grounds for giving more than varietal rank. The variety is quite striking in appearance.

## GENUS CHRYSOGASTER Meigen.

### 68. *Chrysogaster nitidula* n. sp.

(Plate VII.)

Eyes with four vertical stripes, the median two sinuous; third antennal segment distinctly longer than the second; last section of the fourth longitudinal vein somewhat sinuous, joining the third slightly beyond the tip of the second.

Length, 5.5 to 6 mm.

*Female.* Face and front metallic blue, the latter with a brassy reflection in the middle. Facial side margins finely punctured, terminating above in a triangular silvery grey pollinose spot; face, above the supraoral concavity, transversely wrinkled; in profile, almost perpendicular, a little rounded in the middle, above the conspicuous anterior oral margin narrowly but deeply excavated; median part of the face somewhat longitudinally ridged. Front narrowed above; in the middle with a longitudinal groove; on each side with transverse depressions which are numerous, and more or less indiscriminately fused and sinuous. Face and front with sparse, fine, white pile. Occiput concave; along the eyes silvery pollinose; pile white below, cinereous above. Antennæ yellowish red, the third segment brownish except basally below; first segment short, the second about three times as long; third distinctly longer than the second, the apex somewhat acutely rounded below. Arista long, curved, luteous. Eyes pale brown, with a transverse median stripe, a stripe along the margin of the face and front, interrupted below; a straight stripe inside the occipital margin and two sinuous longitudinal stripes on the median area; the lower end of the inner sinuous stripe is connected with the lower end of the stripe along the facial border, and the upper ends of all the stripes are united by the stripe along the frontal orbits; exterior stripe united below with the stripe lying next to it.

Thorax metallic watery bluish, the disc with four longitudinal brown stripes, which are broader posteriorly and do not quite reach the scutellum.

Legs metallic greenish; apices of the femora, broad bases of the tibiæ, first two segments of the anterior four tarsi and the basal three of the hind tarsi, yellow; last two tarsal segments black.

Wings with the apical cross-veins clouded and a large spot connecting the tip of the second vein with the cloud on the apical cross-vein, and more or less distinct longitudinal streaks within the cells, brownish. Apical cross-vein slightly sinuous, joining the third longitudinal vein just beyond the tip of the second. Squamæ whitish, dilutely brownish, with more distinctly brownish border and whitish fringe. Halteres pale luteous yellow, the knob fuscous.

Lateral margins of the abdomen metallic bluish with a brassy reflection, or appearing largely brassy. Disc subopaque bluish, the posterior of the segments with an overlying dull bronze tinge which appears more or less extensive in various lights and is more condensed inside the posterior angles of the segments. Pile inconspicuous; on the lateral margins, fine, whitish.

*Male.* Face more swollen on the lower part of the middle and less deeply excavated. Frontal triangle with short, broad transverse grooves, the longitudinal groove not continuous. Pile of the face, frontal triangle and lower part of the occiput whitish. Vertical triangle bronzed, with sparse but con-

spicuous black pile. Third antennal segment very distinctly longer than the second. The two outer longitudinal stripes on the eyes are not united above in the specimen before me, and the stripe along the inner orbits becomes obsolete opposite the upper apex of the frontal triangle.

The remainder of the specimen has been slightly moistened so that it is impossible to judge correctly of the color, but I cannot see that there is any difference in the areas where the moisture has not touched, and the wings do not differ.

Holotype, female; Oak Creek Canon, Arizona; August, 6,000 feet (F. H. Snow). Allotype, same data; July; in the University of Kansas Museum.

This species has been confused with *bellula* Williston and the two specimens were associated with specimens of that species from the same locality. The stripes on the eyes and the long third antennal segment will at once distinguish it, as in *bellula* the outer stripes, if at all present, are quite against the occipital margin, whereas in *nitidulus* they are well separated from it; the third antennal segment in the former is slightly shorter than the second. Mr. R. C. Shannon, who compared specimens with types and specimens in the United States National Museum stated that there was nothing like it in the collection there.

### 69. *Chrysogaster ontario* n. sp.

(Plate VII.)

Bright metallic steel blue, the disc of the abdomen opaque black; front of the male inflated; wings of the male moderately, of the female apically, infuscated. Closely related to *texana* and *greenei*.

Length, 6 to 7 mm.

*Male*. Face and front metallic bright steel blue; face retreating, with a small tubercle below the middle, slightly more prominent than the oral margin; below the antennæ a narrow transverse band of silvery grey pollen, the lower border of which is scarcely sinuate; on each side of the face, extending obliquely downward from the pollinose band, a rectangular, finely striate area, which ends below in a slightly deeper impression; face and cheeks polished elsewhere. Front rather strongly inflated; upper portion with an elongate oval, longitudinal depression. (The amount of swelling varies somewhat and there is an indication of three lobes, a dorsal and two lateral ones, the depressions between them broad and shallow, but the character may be of little value, as it is almost lacking in one specimen.) Vertical triangle short; blackish blue. On the sides of the face below the tubercle are some distinct black hairs; the hairs of the frontal triangle are all near the eyes and are moderately long, black; those on the vertical triangle and upper part of the occiput are somewhat shorter than on the frontal triangle, while the lower half of the occiput bears still shorter, whitish or yellowish hairs. Antennæ luteous, the third segment more or less fuscous. Arista long, luteous, slightly curved. Third antennal segment distinctly longer than broad, the end evenly rounded (in one specimen it appears almost as broad as long, owing to drying).

Thorax deep blue, in some lights often with a slight purplish tinge; on the disc with four longitudinal blackish or greenish black stripes, the middle ones often united or almost so. Scutellum rather large, usually with a more

purplish tinge, not convex beyond the basal part. Pile of the thorax and scutellum not abundant, moderately long, suberect.

Legs metallic greenish black, the tarsi dull black.

Wings infuscated, more conspicuously so anteriorly, not in patches, but becoming sometimes almost hyaline posteriorly. The apical cross-vein varies somewhat; it is directed obliquely outwards on its basal half and then curves forward, beyond the curve being in some cases at right angles to the third vein, in others slightly recurrent, or it might be slightly curved on this last section. No two specimens seem to agree perfectly; there may be a short stump of vein at the median curve and there is always a stump at the origin of the cross-vein. Notwithstanding this variation the venation is rather characteristic.

Squamæ tinged with fuscous, especially the upper lobe; with a fuscous border; fringe rather cinereous or pale fuscous. Halteres fuscous, the stem largely yellow.

Disc of the abdomen opaque bluish black, the side margins metallic steel blue, but on the basal segments they may have a slight brassy cast, especially marked on the third segment, and rarely the side margins may be largely greenish, but on the fourth segment always bluish. Pile short; whitish on the base and lateral margins; black on the disc, more conspicuous basally. Pile of the venter subappressed, sparse, golden yellow.

*Female*. Face subtriangularly concave, the epistoma about as much produced forward as the tip of the antennal prominence, the deepest part of the concavity about on a plane with the lower part of the front just above the swelling. The transverse band of pollen broadens beneath the antennæ and extends to the deepest part of the concavity; on the sides there are two or three transverse slender depressions on the area corresponding to the striate area in the male. Front wide at the vertex a little widened below; the lower fifth is produced forwards, but on the sides the swollen portion is narrower, so that when viewed from in front it appears as a broad, flat triangle, the upper side of which may be more or less rounded; above each antenna an arcuate depression; on the upper part of the swollen area with or without a longitudinal groove. Middle of the front moderately broadly polished longitudinally; on either side the rugosities numerous, the furrows deep, the ridges broad and rounded; averaging eight or nine; sometimes more or less confluent. The color of the front varies somewhat, but is typically steel blue, but there may be a strong brassy reflection on the sides. There is no pile on the face or front, except on the vertical area, and here and on the occiput it is whitish or pale yellowish.

Thorax and scutellum steel blue, the longitudinal stripes more polished, greenish.

Wings subhyaline; towards the apex distinctly, within the cells less clearly, fuscous.

Abdomen with the disc often similar to that of the male, although the first segment is always wholly opaque. In some specimens the ground color seems to show through, so that the disc appears largely subopaque, this being the case usually on the anterior half of the segments; the opaque seems much more bluish. The fourth segment is only opaque on the base, the fifth segment wholly shining.

Holoypte, male, Guelph, Ontario, July 10, 1913; allotype, female, Orillia, Ontario, June 2, 1921; paratypes, three males and nine females, Orillia, Ontario, May 29 to June 2, 1921; all collected by the author. Types in the Canadian National Collection, Ottawa. Paratypes in the Kansas University museum and the collection of the author.

The specimens were taken chiefly on bloom of *Osmorrhiza claytoni* in cut-over deep woods, but occasional specimens occur on bloom of *Crætagus*.

Specimens of this species were compared with the types of *greenei and texana* by Mr. R. C. Shannon and did not agree with either. From *nigripes* it is readily distinguished by the shining thorax in the male and the more opaque bluish abdomen in the female. From *greenei* it is distinguished by the fewer transverse wrinkles on the face (there are five in a more circular area on either side in a female specimen of that species before me) and the apparently longer pile on the vertex; the color of *greenei* is blackish green, and the antennæ are larger. From *texana* it differs in the infuscated wings and in possessing vittæ on the thorax, as in that species the metanotum is unicolorous.

### 70. *Chrysogaster shannoni* n. sp.

Eyes with numerous confluent and isolated brownish spots; wings with streaks of brown in the cells. A minute metallic green species, the thorax with four rich brown longitudinal stripes. Occurs in Costa Rica.

Length, almost 5 mm.

*Male*. Eyes large, yellowish brown, everywhere with roundish darker brown spots which may be more or less indiscriminately fused. Face and front metallic greenish. Face with numerous transverse grooves, the lower median part, swollen portion about the mouth and the cheeks, smooth; short, in profile almost perpendicular, a little retreating, with a short but deep excavation just above the anterior mouth edge. Frontal triangle almost two-thirds as long as the face. Vertical triangle very long, sepia in color, the small corners metallic greenish. Occiput concave, not visible from lateral view. Antennæ situated at lower third of head, ferruginous; first segment very short, second slightly over twice as long as first, third somewhat longer than the first two combined, its lower end more sharply rounded. Arista fine, about as long as the last two segments; curved.

Thorax metallic green, very densely punctured; dorsum with longitudinal vittæ as follows: medianly, two moderately broad, subcontiguous (contiguous on the posterior third, separated anteriorly by an intermittent slender line which exhibits the punctures) stripes, which extend as a single band over the tip of the scutellum; separated by a metallic stripe, about equal in width to one of the median stripes anteriorly, is a slightly broader one which extends narrowly onto the sides of the scutellum, but ends before its tip; stripes all dull sepia brown and smooth. Dorsum elsewhere with brassy reflections in some lights, the punctures large. The scutellum has a faintly discernible margin.

Legs metallic green; bases of the tibiæ and first three tarsal segments yellow; last two tarsal segments brownish black.

Wings with the apex and anterior margin, and the cross-veins, smoky brown; in addition a small spot behind the tip of the stigmatal cell, a spot joining the

second and third longitudinal veins at the apex of the second, a streak between the second and third veins, streaks in the first posterior and discal cells and a roundish spot before the base of the streak in the first posterior cell, brownish. Elsewhere the wings are almost hyaline. Last section of the fourth longitudinal vein rectangular, joining the third opposite the tip of the second longitudinal vein; last section of the fifth vein oblique. The third vein joins the costa a little before the tip of the wing. Squamæ luteous. Halteres yellow.

Abdomen: Lateral margins metallic brassy, basally metallic bluish; on the apex of each segment, cupreous. Disc subopaque steel blue; posterior margins of the segments, inside the lateral margin of the first and on the fourth extending triangularly forward in the middle almost to the anterior margin, opaque black. Hypopygium shining, somewhat bronzed. The lateral margins are coarsely punctured, while the disc is finely and sparsely so. Pile is not observable.

Holotype, a unique male; Huguito, San Mateo, Costa Rica (Pablo Schild); in the United States National Museum.

## GENUS BRACHYOPA Meigen.

### 71. *Brachyopa basilaris* n. sp.

(Plate VII.)

First two abdominal segments wholly red, the remainder blackish brown; arista bare or extremely short pubescent.

Length, about 9 mm.

*Female.* Lower part of the face polished luteous reddish, the upper portion densely greyish yellow pollinose, the pollen extending along the narrow orbital margins to join that on the occiput below the eyes, and also narrowly upwards along the eyes to join the more yellow pollen of the front. In profile the face is triangularly excavated, the epistoma not quite as prominent as the antennal base. Antennal prominence wholly polished luteous reddish; front black in ground color, but the ground only visible in a median longitudinal stripe and just above the reddish color. Occiput yellowish grey pollinose. Facial side margins with very short, sparse, the front with longer, subappressed, and the occiput with still longer, whitish pile. Antennæ reddish; arista brown, its base reddish.

Dorsum of the thorax opaque brownish grey; with two narrow, median, longitudinal, posteriorly somewhat divergent, shining brown stripes on the anterior two-thirds; broader, interrupted ones on either side; an area of the same color above the base of the wings. Pleuræ almost all reddish, with subobscuring whitish pollen. Pile pallidly brassy, subappressed. Humeri, postalar calli and scutellum reddish yellow, the latter with similar pile to that on the thorax.

Femora luteous on the bases and apices, between diffuse brownish; tibiæ yellow, with dirty brownish bands on the apical half; tarsi yellow basally, the apical segments blackish. Hind femora with two rows of short black bristles on the apical half below. Pile yellowish.

Wings pale yellowish, the veins yellow; only the apical cross-veins brown. Squamæ pallidly yellow, the fringe more yellowish. Halteres yellow.

First two abdominal segments wholly reddish; third segment shining reddish

brown, the apex in the middle portion somewhat reddish; fourth and fifth shining blackish brown, the apices narrowly luteous. Pile pale yellowish, although there appear, in some lights, incomplete black pilose fasciæ on the bases of the third and fourth segments.

Holotype, an unique female; Wawanai, Wash.; in the collection of Dr. A. L. Melander.

This species is readily distinguished from all others so far known from North America by the wholly reddish first two abdominal segments. It is distinguished from *rufiabdominalis* Jones by this character, the less prominent oral margin, lighter-colored thorax, etc.

### 72. *Brachyopa nigricauda* n. sp.

(Plate VII.)

Dorsum of the thorax greyish pollinose, with six longitudinal shining stripes. Scutellum greyish, the margin yellow; abdomen shining black.

Length, 7 mm.

*Female.* Face yellowish white pollinose, concealing the ground color; lower half bare laterally, but on each side of the anterior oral margin a less thickly pollinose area; ground color, where showing, dirty yellowish, a darker spot at the interior angle of the pollen and another below the eyes. Lateral facial stripes distinct and reaching quite as high as the base of the antennæ. Face moderately concave, the epistoma not quite as much produced as the antennal prominence. The latter dirty luteous above apically, its base blackish brown. front moderately narrowed above, densely greyish yellow pollinose, slightly less densely so on the median line, just about each ocellus shining black. Occiput yellowish grey pollinose. Face without pile; cheeks and lower half of the occiput with sparse, short, white pile; upper half of the occiput and front with very short black pile. Antennæ ferruginous red; third segment large, elongate, suboval, a little longer at the apex below. Arista brown, its basal third reddish; not distinctly pubescent.

Dorsum of the thorax densely yellow grey pollinose, leaving a pair of narrow median stripes originating at the front and extending to the apical fourth, a wider, suturally interrupted stripe rising inside of and behind the humerus and narrowing to its apex at the posterior end of the postalar callosity, and a narrow, short stripe above the root of the wings, shining brown. Pleuræ, pectus and humeri, ferruginous reddish, moderately covered with white pollen. Scutellum yellow, the basal half diffuse piceous brownish; a broad, conspicuous preapical depression. Pile of the dorsum short, yellow; of the pleuræ, white.

Legs reddish brownish; bases of the femora, their apices, bases and narrow apices of the tibiæ, first two segments of the middle, and middle two of the hind tarsi, yellowish; all the front tarsi and last two segments of the remainder, blackish. Pile shining yellowish, obscuring the ground color somewhat.

Wings slightly yellow; stigma yellow. Squamæ white, with yellow border and pallid fringe. Halteres reddish.

Abdomen shining black, the apex of the fifth segment obscurely reddish; narrow base of the second segment, the first largely, more or less white pollinose. Pile wholly short, fine, sparse, white. Venter rather blackish, with thin greyish white pollen, the incisures reddish.

Holotype, female; Lyme, Conn.; May 16, 1918; in the collection of Mr. R. C. Shannon.

This species, on account of the color of the abdomen, is very close to *B. daeckei* Johnson, but may be readily distinguished from that species by the presence of six shining stripes on the thorax, more reddish pleuræ and humeri, more extensively yellowish scutellum, yellowish wings, paler legs, etc. The size is about the same.

## GENUS CHALCOMYIA Williston.

### Subgenus CHALCOSYRPHUS new.

*Female.* Face concave, the epistoma not more prominent than the antennal base, extending only slightly below the eyes. Antennæ short, third segment subtriangular oval; arista basal. Front somewhat narrowed, its sides not quite parallel above. Thorax a little narrower than the head; on the apical third, flattened. Scutellum squarish, its disc somewhat flattened, its margin thinned. Femora strong, the hind ones much enlarged and with two rows of strong spines below on the apical half; hind tibiæ arcuate. Wings as in *Chalcomyia*, but the apical cross-vein joins the third longitudinal vein at a right angle, well before the tip of the wing. First two abdominal segments not broader than the thorax, the third and fourth distinctly wider. Type of subgenus, *Chalcomyia* (*Chalcosyrphus*) *atra* n. sp.

In the absence of the male I am forced to place this species in a subgenus of *Chalcomyia*, but it is possible that the eyes of the male are contiguous. The female appears to be more allied to *Chalcomyia* than to any other genus, but the wing venation is quite different. The species remarkably resembles *Myiolepta nigra* Loew in general appearance, but the venation is different.

### 73. *Chalcomyia* (*Chalcosyrphus*) *atra* n. sp.

(Plate VII.)

Length, 9 mm.

*Female.* Face and front shining black, with a bluish reflection; the former faintly whitish pollinose across the concavity; moderately excavated, the oral margin not quite as prominent as the tip of the antennal prominence; side margins well defined below, less clearly so above, but reaching to the base of the antennæ. Pile short, pale yellowish, thinly covering most of the face. Front with a triangular area on either side below the middle and an indefinite area between them, opaque. The antennal prominence rises rather strongly and bears above its base a small roundish tubercle. Ocellar triangle scarcely swollen, the anterior ocellus a little remote. Pile of the front cinereous, on the upper half black and a little longer. Eyes bare. Occiput greyish pollinose; pile cinereous below, becoming black above. Antennæ black; first

segment shining; third segment longer than the basal two combined; subtriangular, the apex broadly rounded. Arista long, bare, yellow.

Thorax subshining black, with three slender more shining stripes on the middle of the dorsum. Pile short, tawny yellow; on the pleuræ somewhat longer and paler. Pleuræ shining. Disc of thorax on apical third, but not reaching the margins, limited laterally by a straight, longitudinal line, flat, perhaps scarcely hollowed; this flattening continued onto the scutellum. Scutellum large, squarish, the hind margin strongly thinned; pile similar to that on the dorsum of the thorax.

Legs black; knees obscurely reddish; hind tibiæ obscurely brownish.

Wings cinereous hyaline, the stigma and clouds on the basal cross-veins pale brownish. Veins black.

Abdomen shining black, with a bluish reflection. Pile short, appearing white in some lights, black in others. Sides of the first two segments almost parallel, the second expanding slightly posteriorly. Venter wholly shining black, with white pile.

Holotype, an unique female, collected by Dr. C. F. Adams at Atherton, Mo., April 17, 1915; in the Kansas University Museum.

## Subfamily XYLOTINÆ Shannon.

### Tribe CRIORHINI Shannon.

This tribe is characterized as follows: Anterior cross-vein at or beyond the middle of the discal cell, usually strongly oblique; third longitudinal vein almost straight; first posterior cell acute apically; face produced downwards or tuberculate; antennæ situated above the middle of the head; thorax without bright yellow markings on the dorsum or pleuræ, except sometimes on the humeri, pleuræ, posterior lateral margins of the dorsum and the scutellum, these spots, if present never composed of pollen; not usually wasplike flies, often resembling bumblebees, but *Somula* wasplike.

#### Genus Cynorhinella Curran.

*Cynorhinella* Curran, Can. Ent., liv, 14, 1922.

Face tuberculate, considerably produced downwards and very slightly forwards; facial side margins well marked to above the middle of the face. Eyes of the male contiguous, bare. Antennæ short, third segment roundish. Thorax distinctly longer than broad, without stout hairs or bristles. Abdomen slender, twice as long as the thorax; tapering in the male, and not wider than the thorax; in the female broad, shorter, triangularly elliptical. Femora all somewhat stout, the hind ones considerably swollen; at the end below with a somewhat angular projection, a smaller one anteriorly in the male.

Hind tibiæ a little arcuate, not ending in a spur. Wings as in *Cynorhina*. Type of genus, *C. canadensis* Curran.

This genus was established by me in the January, 1922, issue of the *Canadian Entomologist* for the reception of an unique male in the Canadian national collection. The genus appears to be a natural one. Since that time I have examined three male specimens of *Myiolepta bella* Williston, and have two females. The two sexes are remarkably different and the face in the female is concave, more produced forwards and with a swelling just above the oral margin, the body short and rather robust. However, the hind femora and legs are practically similar in both sexes. *M. bella* should therefore be placed in the present genus. I had always considered it a dubious *Myiolepta*.

74. *Cynorhinella canadensis* Curran.

(Plate VIII.)

Length, 10 mm.

*Male*. Face chestnut brown; concave below the antennæ; about the middle with a rounded tubercle, below which it is slightly produced to the not prominent anterior oral margin. Facial side margins well defined, as in *Chilosia;* facial slopes with fine whitish pollen, the side margins with sparse whitish pile. Cheeks and frontal triangle shining, concolorous with the face. Vertical triangle brown, its sides about equal; pile brown. Occiput shining chestnut, with brownish above, whitish pile below. Antennæ brownish red; third segment orbicular, slightly flattened below. Arista very long, reddish.

Thorax shining blue black, the dorsum with yellow pile, intermixed with black on the disc, the borders with black pile; pleura yellowish brown, with yellow pile, but black pile above. Scutellum concolorous with the dorsum of the thorax, with slightly longer black pile.

Legs chestnut brown; all the femora swollen, the hind ones considerably so, and moderately arcuate. Hind tibiæ a little arcuate.

Wings distinctly luteous; stigma yellowish. Last section of the fourth longitudinal vein joins the third vein almost in the margin of the wing, thus the first posterior cell is very acute apically. Squamæ and halteres whitish.

Abdomen narrow, gradually narrowing after the second segment; in color shining blue-black, the posterior margins of the second and third segments a little more blackish on the median two-thirds; hypopygium black. Abdominal pile yellow on the basal angles of the abdomen, becoming lighter apically, and whitish on the hypopygium; on the apices of the second and third segments the pile is black.

The type specimen from Inverness, British Columbia, July, 1910 (J. H. Keen), is before me.

## 75. *Cynorhinella bella* Williston.

*Myiolepta bella* Williston, Trans. Am. Phil. Soc., xx, 308; Synopsis, 128.

Deep bluish black; thorax and scutellum black pilose except some hairs on the lower part of the pleuræ, and an additional band across the front of the metanotum in the female.

Length, 7 to 10 mm.

*Male.* Structurally similar to the preceding. Differs as follows: Face and front brownish black; head elsewhere, bluish black. Antennæ black, third segment reddish brown, more reddish below; arista brown.

Thorax and abdomen deeper blue-black; black pilose, except on the lower portion of the pleuræ, which bear some cinereous pile. Scutellum black pilose.

Legs with chiefly black pile. Wings moderately luteous cinereous. Halteres yellow.

*Female.* Face shining black, the upper half thinly greyish pollinose, only visible from above and in some lights. Epistoma somewhat more produced forwards than the antennal prominence, moderately excavated, with a small swelling close to the oral margin. Front rather narrow, somewhat broadened below; with a shallow transverse depression on the lower fourth which emits a median, longitudinal, tapering stripe towards the anterior ocellus, but not nearly reaching it. Pile of the face and lower half of the occiput white, sparse and fine; on the upper half of the occiput, cinereous yellow; on the front wholly stout black, short.

Antennæ brown; third segment largely reddish; larger than in the male.

Thorax and abdomen deep blue-black; the former black pilose, except an anterior band on the dorsum and the lower portion of the pleuræ, where the pile is pale yellowish. Scutellum short black pilose, but four or six longer, stouter black hairs apically.

Legs somewhat more slender, the hind femora not arcuate; entirely black, the inner sides of the tibiæ apically and the tarsal pads golden yellow in some lights, as in the male; pile chiefly yellow; black spinules beneath the hind femora.

Wings as in the male, the anterior cross-vein apparently just a little closer to the base of the discal cell.

Abdomen broader than the thorax, the greatest width at the apex of the second segment, beyond which it gradually narrows; not quite twice as long as the thorax; pile short, white; on the broad apices of the second and third segments, shorter, black. Venter rather luteous piceous, lighter on the median portion.

Five specimens from British Columbia; July.

It is quite possible that the preceding species is only a variation of this, as I can find no structural characters by which to separate them. The color of the pile is strikingly different, but the specimen described as *canadensis* may be teneral. However, until further material is secured I have left it as distinct. There can be no doubt about the present species being *M. bella* Williston, and the two sexes certainly belong together.

This genus seems to connect *Myiolepta* with *Cynorhina,* and I strongly suspect that the relationship is close. There is no doubt but that the *Brachyopini* of Shannon is placed in a slightly unnatural position, even though it is

closely related to *Chilosini*. The relationship of the various genera in the two subfamilies is a question open to debate.

## GENUS CYNORHINA Williston.

*Cynorhina* Williston, Synopsis, 209 (subgenus of *Criorhina*). Verrall, British Flies, viii, 576, 1901. Lundbeck, Dipt. Dan. 501, 1908.

*Blera* (Billberg) Johnson, Psyche, xviii, 73, 1911; Ent. News, xxiv, 294, 1913.

Differs from allied genera in the short pile, short abdomen; contiguous or subcontiguous eyes, nonpilose face, and in not usually resembling wasps or bumblebees. The third longitudinal vein is almost straight and joins the costa just before the tip of the wing; first posterior cell acute apically, extending almost to the wing margin before the tip. Type of the genus, *C. analis* Macq.

There has been some dispute as to whether the name *Blera* or *Cynorhina* should be applied to this group of flies. Williston proposed the name *Cynorhina* for a subgenus of *Criorhina*, including all those species then known in the genus, which would come under the limits which I have placed upon it. Johnson (*l. c.*) shows that Billberg (Enumeratio Insectorum, 118, 1820) had used the name *Blera* for what was undoubtedly *Criorhina (Musca) fallax* L., but at the same time it must be pointed out that Billberg also included in his genus a species which probably was a *Chrysogaster*, and no type of the genus was designated, as was necessary under the circumstances. Williston established his subgenus upon abolutely firm grounds, and there could be no question about his genus, which dates from 1886. As there was no type species for the genus *Blera* until 1911, Williston's name must be given priority.

The immature stages are passed in rotting wood and sometimes in exuding sap of trees.

### SYNOPSIS OF SPECIES.

1. Face wholly yellow on ground color or with a median black stripe, the yellow of the face never diffuse ..... 5
   Face black in ground color; if largely yellow the yellow diffuse or due to pollen; sides or corners of face black, the middle lighter ..... 2
2. Abdomen wholly black in ground color; eyes of the male contiguous ... 3
   Abdomen with the second and third segments bright yellow laterally; eyes of male distinctly separated ..... *umbratilis* Williston
3. Abdomen wholly black pilose beyond the second segment; pile of thorax yellow, rather long, dense, scutellum black ..... *robusta* Curran
   Abdomen more or less yellow or whitish pilose beyond the second segment or the thorax wholly black pilose dorsally; the pile shorter, more sparse, not obscuring the ground color ..... 4
4. Thorax black pilose; blackish blue species ..... *nigripes* n. sp.
   Thorax yellowish pilose; aëneous species ..... *nigra* Williston
5. Face with a median black stripe ..... 6
   Face entirely yellow ..... 8

6. Scutellum reddish or yellowish apically.....*metcalfi* n. sp.
   Scutellum wholly aëneous..... 7
7. Hind femora yellow at the base.....*badia* Walker
   Hind femora black at the base.....*confusa* Johnson
8. Scutellum partly or wholly yellow; hind femora yellow basally..... 12
   Scutellum wholly blackish; abdomen rarely wholly black..... 9
9. Hind femora yellow on the basal half; humeri yellow..*humeralis* Williston
   Hind femora black on basal half..... 10
10. Humeri and the posterior of the mesopleuræ yellow; abdomen with reddish yellow spots.....*scitula* Williston
    Humeri black, although they may be dusted with light-colored pollen.. 11
11. Abdomen unicolorous; eyes of the male separated..... 14
    Fourth and fifth abdominal segments red.....*analis* Macquart
12. Abdomen entirely blackish; scutellum wholly yellowish, *johnsoni* Coquillett
    Abdomen with yellow spots on the sides of the second and third segments; scutellum not wholly yellowish..... 13
13. Dorsum of the thorax yellow laterally behind the wings, continued in about the same width around the margin of the scutellum, *pictipes* Bigot
    Dorsum of thorax not reddish yellow or yellow laterally behind the wings; scutellum yellowish apically, but not clearly so laterally at the base .....*notata* Wiedemann
14. Last two abdominal segments wholly black pilose.....*armillata* O. S.
    Last segment wholly, the third largely tawny pilose,
    *armillata* var. *hunteri* n. var.

## 76. *Cynorhina nigra* Williston.

(Plate VIII.)

*Criorhina* (Cyn.) *nigra* Williston, Synopsis, 214.

Abdomen black, the hind margins of the fourth segment obscurely luteous; face black, in the middle more or less luteous.

Length, 7.5 to 8.5 mm.

*Male.* Face black or luteous brownish, obscured by silvery pollen, except a median stripe which expands under the antennal base and the cheeks, which are shining black; sometimes a luteous spot on the cheeks immediately beneath the eyes. In profile the face is slightly receding from the antennal base to the oral margin, above the middle with a slight swelling, which is not more conspicuous than the swelling of the anterior oral margin. Sides of the face (on the margins) with short, sparse, white silvery pile; similar pile on the cheeks. Frontal triangle shining black, the sides with silvery pollen; tip of the antennal prominence yellowish or reddish. Vertical triangle black, scarcely shining, with cinereous or yellowish pile. Eyes touching for a short distance. Antennæ piceous; third segment thinly pollinose; short oval.

Thorax, scutellum and abdomen greenish black; dorsum of thorax aëneous, with four duller olivaceous stripes. Pile short, fulvous.

Legs black; knees more or less yellowish.

Wings cinereous hyaline; yellow basally; squamæ bright yellowish, with yellow fringe. Halteres yellow.

The apices of the second and third abdominal segments appear deeper black in some lights. Apex of the fourth segment and the hypopygium luteous, sometimes the apices of the second and third segments obscurely luteous. Pile short, yellow; longer on the basal angles.

*Female.* On the face a yellow triangle occupies the middle portion; front broadly dusted across the middle; moderately narrowed above. Knees a little more extensively yellowish. The pile a little longer and brighter.

Twelve specimens: New Hampshire, Massachusetts, Maine, Quebec and New Brunswick.

This species is readily distinguished from allied species by the yellow pilose thorax, practically unicolorous abdomen, diffusely yellowish face, and its small size.

### 77. *Cynorhina nigripes* n. sp.

(Plate II.)

Deep shining black; face reddish, diffuse; wings yellow basally; legs entirely black, except just the knees of the female.

Length, 9 to 10.5 mm.

*Male.* Face reddish, the color diffuse; lower part on the sides, extending up about half way, cheeks and frontal triangle above the middle of the antennal prominence, shining black; sides of face and frontal triangle white pollinose. Face retreating from the tip of the prominence to a little above the oral margin. Frontal triangle without pile; face with fine white pile on the side margins and lower sides of the prominence; lower half of the occiput with longer, similar colored pile; upper half of occiput and vertical triangle with short black pile. Vertical triangle black, longer than broad, acute anteriorly. Occiput yellowish grey pollinose, more densely so along the orbits.

Antennæ brownish, shining, third segment reddish; arista reddish brown.

Thorax, scutellum, abdomen and legs deep shining black. Dorsum of the thorax with a thinly greyish pollinose area inside the humeri. Pile of thorax and scutellum, short, stout, black.

Legs all rather slender, with black pile and tawny tarsal cushions.

Wings rather brownish hyaline, or broadly luteous along the veins; the base bright yellow. Stigma yellow. Squamæ bright yellow or orange, with similarly colored border and fringe. Halteres bright yellow.

Pile of the abdomen black, short and rather stout; on the basal portion and broad segmental basal fasciæ, subinterrupted in the middle and occupying the whole of the sides of the third and fourth segments, with cinereous pile, in some lights appearing whitish; genitalia wholly whitish pilose. Venter shining black, the incisures greyish yellowish.

*Female.* Face as in the male, but slightly more concave. Front with the sides nearly parallel on the upper three-fourths; below the middle thinly yellowish grey pollinose and densely punctured; elsewhere shining black; frontal pile black.

Knees reddish; tibiæ and tarsi more brownish.

Abdomen a little more conspicuously whitish pilose, in some lights rather tawny in the middle of the second segment. Fifth segment black pilose, the anterior angles with cinereous pile.

Holotype, male; Victoria, B. C., April 26, 1916 (R. C. Treherne); in the Canadian national collection, Ottawa. Allotype, female, Vancouver, B. C., June 4, 1915; in the collection of Dr. C. L. Metcalf. Paratypes, three males; Vancouver, B. C.

This species is very much like *Cynorhinella canadensis* Curran, but is readily distinguished by the facial profile, more slender legs and more extensive black

pile; the same applies to *Cynorhinella bella* Williston. While evidently close to *C. nigra* Williston, it is at once distinguished by the deep black color, wholly black legs, and black pilose thorax.

## 78. *Cynorhina robusta* Curran.

*Cynorhina robusta* Curran, Can. Ent., liv, 14.

Thorax and scutellum moderately long, pale yellow pilose; abdomen black pilose except the basal corners, which bear yellow pile; head brown and black pilose; face chiefly piceous, but yellow above.

Length, 11 mm.

*Female.* Face piceous, immediately below the antennæ, more so at the sides, yellow; cheeks black; thinly silvery pollinose, the side margins sparsely whitish pilose. In profile the sub-keel-shaped face is slightly swollen below the middle, indicating a long tubercle. Antennæ black; third segment orbicular and reddish brown in color, the base reddish below. Arista black. Front shining black, somewhat narrowed above; antennal prominence narrowly reddish apically. Pile of the front black; under the eyes yellowish; on the lower half of the occiput brown, black on the upper half; moderately long below. Posterior orbits narrowly greyish white pollinose.

Thorax shining deep blue-black; mesopleuræ margined with reddish except below. Dorsum brassy; clothed with rather long, pale yellow pile; pleuræ bare except on the mesopleuræ and sternopleuræ. Scutellum similar in color and pile to the dorsum.

Legs blackish; short black pilose, longer on the femora; femora tipped with yellow; bases and apices of the tibiæ yellow or yellowish; first three segments of the anterior four and the second and third of the hind tarsi, yellow.

Wings somewhat brownish, less so outwardly, their bases very conspicuously yellow; stigma brownish, but not differing much from the general color of the wings. Squamæ whitish yellow, with similar colored border and fringe. Halteres yellow.

Abdomen wholly shining black, with a strong purplish reflection; pile wholly short and black, except on the small basal angles, where there is a patch of longer yellow pile. First two ventral segments yellow apically at the sides.

I have only the type before me, a female from British Columbia; in the Canadian national collection, Ottawa, Canada.

A robust, conspicuous species, somewhat approaching *Criorhina,* but the pile is much too short and the facies are those of *Cynorhina.* Best characterized by the color of the face and the pile, which is longer and denser than usual.

## 79. *Cynorhina pictipes* Bigot.

(Plate II.)

*Calliprobolla pictipes* Bigot, Ann. Soc. Ent. Fr., 1883, 354.
*Criorhina pictipes* Williston, Synopsis, 296 (doubtfully refers it to *notata* Wd.).
*Blera pictipes* (Bigot), Banks, Greene, etc., Proc. Biol. Soc. Wash., xxix, 191.

Sides of the metanotum behind the wings, border of the scutellum, the humeri and a stripe on the mesopleuræ, yellow.

Length, 9 to 10 mm.

*Male*. Face and front honey yellow or whitish yellow, the sides of the former with thin white pollen; cheeks black. In profile the face is moderately concave on the upper half, almost perpendicular below. Antennal prominence obtusely conical. Pile of the face very short, white, limited to the side margins and lower sides of the frontal prominence; frontal triangle bare. Eyes subcontiguous. Vertical triangle black, elongate; with moderately long, sparse, yellow pile. Occiput greyish yellow pollinose, with long yellow pile. Antennæ black or brown, the third segment broadly yellow on the basal half; in shape transversely broadly oval, rather large. Arista yellow, darker apically.

Thorax and scutellum blackish green, the dorsum with a brassy or brassy bronze reflection. Humeri, a vittula on the mesopleura, the lateral margins of the dorsum behind the suture and the border of the scutellum, yellow. Pile yellow.

Legs yellow; apical third or more of the femora shining black; tibiæ, except the middle ones, with an obscure, subapical brownish or blackish band; anterior tarsi and last two segments of the posterior four, black or brown; posterior basitarsi brownish above, except both ends. Pile of the legs pale yellowish.

Wings tinged with luteous brownish, more hyaline posteriorly; sometimes a cinereous brownish area apically. Squamæ whitish, with palid yellow fringe. Halteres yellow.

Abdomen shining black. Sides of the first segment, crescentric spots, wholly touching the anterior margin of the second segment, their inner ends truncate and reaching caudad almost or quite to the middle of the segment, their outer ends broadened and reaching narrowly along the lateral margins towards but not quite reaching the posterior angles, reddish yellow or yellow; the spots rarely narrowly connected along the base of the segment. Very narrow apex of the second, narrow apex of the third, and posterior margin of the fourth segments reddish or reddish yellow. Venter black, the first two segments yellow. Pile of the abdomen yellow, somewhat cinereous on the apical median portion of the second and third segments.

*Female*. Face less deeply concave above. Front narrowed above, shining greenish black on the upper two-thirds, colored like the face below; pile wholly yellow. Wings with a brownish cinereous cloud apically.

Third abdominal segment with a much narrower crescentric spot than that on the second, its inner ends obsolete.

This description is drawn from seven males and three females from Mississippi and North Carolina, April and May.

This species is distinguished from *notata* Wiedemann, with which Williston thought it might be synonymous, by the shape of the abdominal spots, yellow margins on the posterior half of the thoracical dorsum, wholly black apical two ventral abdominal segments, etc.

## 80. *Cynorhina notata* Wiedemann.

(Plate II.)

*Milesia notata* Wiedemann, Auss. Zweifl., ii, 109. McQuart, Dipt. Exot., ii, 2, 80.
*Syrphus profusus* Walker, List, etc., iii, 578 (O. S.).
*Criorhina (Cynorhina) notata* (Wied.) Williston, Synopsis, 215.

Face and frontal triangle pale waxy yellow; the cheeks, tip of the oral mar-

gin and the apex of the frontal prominence, piceous brownish; humeri and apical half of the scutellum, yellowish; abdomen with two (male) three (female), pairs of yellow spots; all the femora yellow at the base.

Length, 11 to 12 mm.

*Male*. Face and frontal triangle bleached waxy yellow; a median stripe extending over the frontal triangle broadly, and the front of the cheeks, shining; elsewhere covered with fine, pallid pollen; cheeks, tip of the oral margin anteriorly, and the apex of the antennal prominence, piceous brownish. Face a little receding, with a slight, long prominence somewhat below the middle. Frontal triangle without pile; facial pile short, pale yellow, sparse, limited to the side margins and the lower sides of the antennal prominence. Eyes markedly contiguous. Vertical triangle long, obtuse in front, brassy greenish, with brownish pile; vertex and occiput with yellow pile. Occiput densely greyish pollinose, becoming yellowish pollinose below the eyes. Antennæ reddish, more or less brownish above. Arista reddish.

Dorsum of the thorax aëneous, the disc brassy; pleuræ, except the obscurely reddish or aëneous middle, and the pectus, black. Scutellum aëneous basally, then with a bluish reflection, about the apical half yellowish, translucent. Pile yellow, somewhat shining.

Legs: Femora piceous black, the narrow bases of the anterior, broader bases of the middle and broad bases of the hind ones, the apices more broadly below on the front four, yellow; anterior four tibiæ and first three segments of their tarsi, yellow; hind tibiæ yellow, the apical two-thirds, except the tip, piceous brownish; tarsi blackish brown, the hind ones brownish red on the intermediate segments.

Wings yellowish basally and anteriorly, becoming luteous beyond the base of the yellow stigma; posteriorly, greyish hyaline. Squamæ whitish, with yellow border and fringe. Halteres yellowish.

Abdomen shining bluish black; lateral basal appendage of the first segment, spots on the base of the second segment at the sides, extending inwards over one-third the distance to a sharp point, their anterior margin concave, the posterior margin somewhat sinuate, but almost straight and directed slightly caudad laterally, basal narrow spots on the lateral third of the third segment, their posterior margin a little convex, their inner ends obtuse, reddish yellow. The spots on the second segment occupy less than one-half the length of the segment and are a little oblique, their inner ends being more caudad. Abdominal pile short, yellow, erect, longer on the basal area. Venter reddish yellow; first and fourth segments piceous black, except the apex of the latter; second and third with irregular, transverse piceous black bands.

*Female*. Cheeks lighter in color, the jowls largely orange; front moderately broad, shining; obscurely cupreous above, densely punctured across the median third, below which it is waxy yellow, the sides broadly pollinose. Frontal pile all black, except at the vertex; occiput with reddish yellow pollen, which seems to be more abundant than in the male.

Thorax a little more bronzed. Legs reddish yellow; about the subapical half of the hind femora and tibiæ and the apical two segments of all the tarsi, piceous or blackish brown. Color of the wings more luteous, but less distinct in the middle of the cells.

Pile of the thorax and abdomen more reddish; abdominal spots on the second segment a little narrower and somewhat longer; on the third segment,

broader, more pointed; on the fourth segment a spot on each basal angle, small, triangular, reddish. Fifth segment with black pile apically.

This description is drawn from two specimens in the collection of Doctor C. L. Metcalf, both collected by him: male, Southport, N. C., April 6, 1914; female, Lake Waccamaw, N. C., April 8, 1914.

The male specimen agrees perfectly with Wiedemann's description, and there cannot be the slightest doubt about the distinctness of Bigot's *C. pictipes*. Wiedemann says that the first pair of spots are crescentric; this is due to the concavity of their front margin; they are hardly truly crescentric even in the male, and certainly not so in the female, as the spots in this sex are hardly concave anteriorly. The fact that the first ventral segment is piceous, aside from other characters, at once distinguishes this species from *pictipes*.

(NOTE.—I have recently examined Wiedemann's types of this species. These differ but little from the above description.)

## 81. *Cynorhina metcalfi* n. sp.

(Plate II.)

Face and front with a median black stripe; hind femora yellow on the basal fourth; apex of the scutellum, and the humeri, yellow; abdomen with two pairs of spots in the male.

Length, 11.5 to 12 mm.

*Male*. Face and front bleached waxy yellow; densely covered with yellowish white pollen; a median stripe on the lower two-thirds of the former, a broad stripe on the front and the cheeks, shining black or piceous. Face slightly receding, with a moderate, long swelling below the middle. Frontal triangle without pile; face with very fine, almost white pile on the side margins and the lower sides of the prominence. In the middle of the black stripe of the front a long longitudinal depression. Eyes contiguous, more strongly so before the vertical triangle, which is long and moderately acute, black, with yellow pile. Occiput yellowish grey pollinose, with yellowish white pile which becomes more yellowish above. Antennæ black, third segment more brown. Arista luteous, the apical fourth black.

Thorax piceous, the dorsum cupreous black; humeri yellowish. Scutellum brownish black, shining, its apex yellowish. Pile pale yellowish, longer on the pleuræ.

Legs shining brownish; basal third of the hind femora, apices of all the femora, base of the hind tibiæ and the first three segments of the anterior four tarsi, yellow, the third tarsal segment sometimes darker; anterior four tibiæ yellow, with obscure darker bands, very broad and brownish on the front ones, where they occupy about half the subapical area, narrower and near the middle of the median tibiæ.

Wings subhyaline; stigma yellowish. Squamæ white, with pallid yellow border and fringe. Halteres pale yellow.

Abdomen piceous blackish, the basal portions of the third and fourth segments and the basal portion of the second more blackish. Second segment with a pair of yellow spots, their outer ends occupying a little more than half the segment and joining the broad lateral margins of the first segment, their hind margins sinuate, the spots narrowed somewhat inside their outer ends by a concavity, their inner ends narrow and obtusely rounded, directed

just a little caudad. Third segment with a pair of small, triangular basal spots. Broad triangular apices of the second and third segments and the small triangular apex of the fourth, black pilose; elsewhere with yellowish pile. Venter yellowish; fourth segment wholly, the third, except the base and apex, piceous brownish.

Holotype, male; Southern Pines, N. C., April 1, 1913 (A. H. Mance); in the collection of Doctor Metcalf.

This species presents much the appearance of *C. notata* Wied., but may be at once distinguished by the black facial stripe, color of the venter and shape of the abdominal markings. From *C. badia* Walker it is distinguished by the color of the venter, which has the first segment chiefly black in that species and the third segment wholly yellow, as well as by the yellow margin of the scutellum. From *C. humeralis* Williston and *pictipes* Bigot it is distinguished by the black facial stripe.

## 82. *Cynorhina badia* Walker.

*Xylota badia* Walker, List iii, 559.
*Eristalis intersistens* Walker, List iii, 615.
*Criorhina (Cynorhina) intersistens* (Walk.) Williston, Synopsis, 212.
*Blera badia* Johnson, Psyche, xviii, 73.

Face with a median black stripe; hind femora yellow basally; first and last ventral segments blackish.

Length, 9 to 12 mm.

*Male.* Face creamy colored; cheeks, and a moderately broad median stripe which ends in an angular point a little above the middle, shining black; the creamy ground color is covered with yellowish white pubescence, except above the median black stripe. Lower part of the face with a small convexity; side margins and lower sides of the antennal prominence with short whitish pile. Frontal triangle shining black, the orbital margins narrowly yellow pollinose; without pile. Vertical triangle greenish black, with long yellow pile. Occiput yellowish grey pollinose, almost bare above; with yellow pile. Cheeks not pilose. Antennæ piceous, third segment somewhat reddish basally below, suborbicular, a little longer than broad. Arista brown. Eyes contiguous.

Thorax aëneous, with more or less cupreous reflection on the disc; pectus black. Pile yellowish. Scutellum aëneous, with a small rounded depression, subapically; pile yellowish.

Anterior four femora black, their bases sometimes obscurely or quite reddish, their tips yellow; hind femora yellow, with a broad black band on the apical third, the apex yellow. Tibiæ yellow, with a broad preapical black band, which occupies two-thirds of the hind ones. Two basal tarsal segments yellow, the remainder black, the hind basitarsi blackish above, except either end.

Wings cinereous hyaline, the anterior basal half yellow; stigma yellow. Squamæ whitish, with yellowish border and fringe. Halteres yellow. Abdomen steely black, the hypopygium aëneous. Second segment with the lateral margins yellow, less broadly so posteriorly, the yellow extending broadly inwardly on the anterior of the segment, the inner ends rather blunt. Lateral margins of the third segment, continuous with the second, becoming very narrow posteriorly, yellow. Pile yellow; apical third of the second, third and fourth segments with black pile, or the fourth segment wholly yellow pilose.

*Female*. Front moderately narrowed above, shining greenish black; sides to almost opposite the ocellar triangle, a little expanded in the middle, yellow pollinose. Frontal pile sparse, yellow.

The spots on the second abdominal segment are larger and more triangular, the inner ends of the triangle squarish; the yellow extends more broadly back along the sides of the third segment and sometimes continues onto the fourth.

Fifteen specimens; New Hampshire, Pennsylvania, Quebec, Ontario, Vermont and Maine. Northeastern states and Canada as far west as Minnesota and Manitoba.

Major E. E. Austen has very kindly compared specimens with Walker's types of *Eristalis badia* and *Xylota intersistens*, and advises that the specimens forwarded for comparison are identical with the types.

### 83. *Cynorhina confusa* Johnson.

*Blera confusa* Johnson, Ent. News, xxiv, 294.

Face with a median black stripe; hind femora black basally.

Length, 9 to 12 mm.

*Male*. Face yellow, with whitish pollen; a median stripe, sometimes reaching obscurely to the antennal base, and the cheeks, shining black. Antennal projection moderately prominent. Face with a swelling covering more than the middle half, not distinctly tuberculate. Frontal triangle almost horizontal, shining blackish, the orbital margins narrowly pollinose. Facial side margins and lower sides of the antennal prominence with very short white pile; frontal triangle bare. Vertical triangle shining black, with chiefly black pile. Occiput yellowish grey pollinose near the eyes, bare at the vertex and in the vicinity of the oral opening, its pile yellow; cheeks bare. Antennæ piceous or black, the first segment usually black, the third brownish, suborbicular, a little longer than broad. Arista brown.

Thorax aëneous, the disc more or less brassy or cupreous in some lights. Pile yellowish; a band between the roots of the wings, black. Scutellum somewhat impressed on the disc, aëneous, its pile yellowish.

Legs black; apices of the femora, broad bases of the tibiæ and their apices, first three segments of the anterior four tarsi and the tips of the basal three of the hind tarsi, yellow.

Wings cinereous hyaline, yellow basally; stigma luteous. Squamæ whitish, with yellow border and fringe. Halteres yellow.

First abdominal segment slightly shining black. Second reddish yellow, except the base incompletely and a broad posterior band on the middle half of the segment which is broadly connected to the anterior band, shining black. Remaining segments shining black. Third segment with the lateral margins, more broadly in front, reddish yellow. Sometimes a small area on the anterior angles of the fourth segment, yellow. The yellow on the base of the third segment usually extends farther inwards than that on the apex of the second. Pile short, yellow on the basal half of each segment and the broad lateral margins; elsewhere short, black.

*Female*. Front moderately narrowed above, moderately dusted with greyish yellow pollen, which leaves an area on the antennal prominence and the upper fourth shining. Frontal pile yellow, but across the ocellar triangle and on the sides of the lower half, black.

Dorsum of the thorax without a black pilose band between the roots of the wings, but with a cluster of black hairs at either side.

Yellow area of the third abdominal segment not so broad anteriorly, often not extending as far inwards as the yellow of the second segment at the apex. Black pile limited to the apical borders of the segments.

Twenty-four specimens before me from New Hampshire, Quebec, Maine and Manitoba.

This species is readily distinguished from species with a black facial stripe by the black posterior femora, more conical face, shape of the abdominal markings, and shorter pile.

### 84. *Cynorhina analis* Macquart.

*Milesia analis* Macquart, Dipt. Exot., ii, 2, 79.

*Criorhina (Cynorhina) analis* (Macq.) Williston, Synopsis, 214; Proc. Am. Phil. Soc., xx, 330.

Length, 11 to 12 mm.

*Male.* Face and frontal triangle shining yellow, the sides of the face and frontal orbital margin thinly pollinose. Face a little concave above; below the middle with a tuberclelike swelling, a little produced downwards. Cheeks black, their narrow orbital margin reddish. Vertical triangle greenish black; yellow pollinose before the anterior ocellus. Occiput grey pollinose, with whitish or cinereous pile; cheeks and vertical triangle with similarly colored pile; facial side margins and the lower sides of the antennal prominence with very short, fine, white pile. Antennæ yellowish red; third segment suborbicular; arista reddish, the apical half black.

Thorax metallic blackish green; humeri and mesopleuræ grey pollinose; wholly with faintly greyish yellow pile. Scutellum concolorous with the thorax, with similarly colored pile.

Legs black; tips of the femora, narrow base and end of the hind tibiæ, bases and apices of the anterior four tibiæ and the basal three segments of all the tarsi, yellow.

Wings cinereous hyaline; yellow basally in front. Stigma yellowish Squamæ white, with white fringe. Halteres yellow.

Abdomen shining deep black; the fourth segment, except sometimes the narrow base which may emit a small median triangle caudad, orange or reddish. First segment and basal half of the second on the sides and basal fourth in the middle, with similarly colored pile to that on the thorax; remainder of the second and third segments black pilose. Fourth segment and hypopygium with yellowish red or tawny pile.

*Female.* Front considerably narrowed above; reddish yellow, black behind the anterior ocellus; pollinose on each side to above the middle, the pollen expanding almost to the median line above. Frontal pile short, yellow.

Base of the fourth abdominal segment more broadly black, the median triangle larger, sometimes rather squarish apically.

Fifteen specimens from Ontario, Quebec, New Jersey, Maine and Pennsylvania. Occurs generally throughout the Eastern states and Canada as far as western Ontario.

## 85. *Cynorhina armillata* Osten Sacken.

*Criorhina armillata* Osten Sacken, Bull. Buff. Soc. Nat. Sci., iii, 68; Cat., 251. Coq., Proc. Wash. Acad. Sci., ii, 436.

*Criorhina* (*Cynorhina*) *armillata* (O. S.) Williston, Synopsis, 213.

Face wholly yellow; abdomen unicolorous; black pilose beyond the first two abdominal segments, except in a variety.

Length, 10.5 to 11.5 mm.

*Male.* Face and front honey yellow; face above and on the sides with thin, similarly colored pollen; a little below the middle with an obtuse tubercle, below which it is perpendicular to the oral margin, above moderately concave. Cheeks shining black, the narrow orbital margin, expanding below the eyes, and an obscure oral border, similarly colored to the face. Facial side margins, the lower sides of the antennal prominence and the cheeks, thinly yellow pilose, the hair moderately long on the latter. Front shining, except the very narrow orbital margins. Vertical triangle black, with bright yellow pile. Occiput greyish pollinose, with yellow pile. Eyes narrowly separated. Antennæ reddish, the third segment orbicular; arista black.

Dorsum of the thorax brassy, with two slender median and a wider stripe on either side, sometimes obscure, cupreous. Pile fulvous. Pleuræ and pectus deep black, the former with brown pile and some yellow hairs intermixed. Scutellum greenish black, with similar pile to that of the dorsum.

Femora black on about the basal two-thirds; apices of the femora, the tibiæ except a black ring, and the basal three tarsal segments, yellow. Last two tarsal segments black or brown.

Wings cinereous apically, yellowish on the basal two-thirds. Stigma yellow. Squamæ yellow, with yellow fringe. Halteres yellow.

Abdomen deep shining black, with abundant short black pile, the basal angles with longer, yellow pile.

*Female.* Front honey yellow below, the upper part and the vertex blackish bronze, the pile fulvous or bright yellow.

Two specimens from Ontario. Originally described from Quebec. It has also been recorded from New Hampshire, Alaska, Oregon and Montana.

## 85*a*. *Cynorhina armillata* var. *hunteri* new var.

This variety is distinguished from the typical species by the very much more extensive fulvous pile on the abdomen. In the specimen before me the abdomen is all fulvous pilose except a broad incomplete band on the basal half of the second segment and a small basal area on the third segment. The specimen has just been received.

Holotype, Teulon, Manitoba, 1922 (Dr. A. J. Hunter).

## 86. *Cynorhina Johnsoni* Coquillett.

*Criorhina Johnsoni* Coq., Can. Ent., xxxix, 75.

"*Female.* Length, 12 mm. Head opaque black; lower third of the front and face entirely yellow; cheeks similar narrowly against the eyes; proboscis not longer than the height of the head; antennæ yellow; third segment and arista brownish. Thorax shining metallic bronze, its pile short, abundant, yellow; humeri yellow, pleuræ black, its pile yellow. Scutellum translucent pale yellow, its pile abundant, long, yellow. Abdomen shining metallic pale

bluish, its pile short, sparse, depressed, yellow, that on the hind end of the second segment, broadly extending forward on the middle of the dorsum, and a crossband on the third segment behind its middle, black. Legs yellow, apices of the femora brown. Wings yellowish hyaline.

"Differs from all previously described species by its yellow scutellum. The face resembles figure 7, Plate IX of Williston's "Synopsis" (*C. umbratilis*), but the facial tubercle is larger and the under side of the head is more horizontal. The venation is similar to figure 3 of the same plate (*C. analis*), except that the third vein is straighter and its last section longer." (Coquillett, *l.c.*)

Originally described from Washington state, and apparently not since recognized.

### 87. *Cynorhina humeralis* Williston.

(Plate VIII.)

*Criorhina humeralis* Williston, Proc. Am. Phil. Soc., xx, 330; Synopsis, 214 (subgenus *Cynorhina*).

Face and frontal triangle honey yellow; humeri and mesopleural spot yellow; scutellum greenish black; abdomen with two or three pairs of reddish spots.

Length, 11 mm.

*Male.* Face and front honey yellow, the sides thinly yellowish pubescent; cheeks shining black. Face with a slight swelling below the middle, the side margins and the lower sides of the antennal prominence sparse whitish pilose. Vertical triangle shining greenish, with yellow pile. Occiput greyish yellow pollinose, with fulvous pile. Cheeks bare. Eyes contiguous. Antennæ yellowish red; third segment suborbicular; arista reddish, brown apically.

Thorax greenish black, the dorsum brassy, with four more or less distinct cupreous stripes. Humeri and a spot on the mesopleuræ, opaque yellow. Pile fulvous. Scutellum shining greenish black, its narrow margin yellowish.

Legs reddish yellow; anterior four femora, except their apices above, and apical two-thirds below, the apical half of the hind femora, except the tip, and the last two segments of all the tarsi, black. Posterior tibiæ with an incomplete preapical band and their basitarsi above, brownish.

Wings cinereous hyaline, yellowish on the anterior basal half; stigma yellow. Squamæ whitish, with yellow border and pale yellow fringe. Halteres yellow.

Abdomen shining black. Second segment on either side with a large triangular yellow spot, the inner ends rounded; posteriorly the lateral margins narrowly black. Anteriorly the sides and narrow base of the third segment, occupying the lateral fourth, and small spots on the anterior angles of the fourth segment, yellow. Pile fulvous, long on the basal angles; black on the apical half or less of the second and third segments and more or less black on the disc of the fourth basally.

*Female.* Front yellow on the lower third, black above; pile yellow, more fulvous in the middle.

Second, third and fourth abdominal segments with rectangular reddish or yellowish spots on the anterior angles, their inner ends rounded, those on the second broadened laterally to occupy almost the whole length of the segment; following spots occupying about two-thirds the length of the segments, at the sides, the third pair apparently somewhat separated from the anterior corner of the segment and therefore somewhat oblique; fifth segment reddish

except the tip, which emits a narrow median black line to the anterior margin.

Male, Walnut Creek, Cal., April; female, Santa Cruz Mountains, Cal., May; male, Carmel, Cal., May 28; and two males from Washington state. Also recorded from Oregon and British Columbia.

This species may be distinguished from other species by the very narrow yellow tip of the scutellum, the shape of the abdominal markings and their arrangement.

### 88. *Cynorhina scitula* Williston.

*Criorhina scitula* Williston, Proc. Am. Phil. Soc., xx, 331; (*Subgenus Cynorhina*) Syn., 215. Coquillett, Proc. Wash. Acad. Sci., ii, 436.

Length, 10 to 13 mm.

*Male*. Face yellow, with yellow pollen; cheeks shining black. Face with a prominent rounded tubercle in the middle; side margins and the lower sides of the antennal prominence with sparse, short yellowish pile. Frontal triangle opaque yellow. Vertical triangle black, with black pile. Occiput greyish yellow pollinose, with bright yellow pile. Antennæ red, third segment obscurely brownish above. Arista brown.

Thorax and scutellum aëneous, the humeri and border of the latter yellow. Pile bright yellow before the suture, on the narrow lateral margins and immediately in front of the scutellum; on the disc caudad of the suture, black. Scutellum with long, bright yellow pile, but some black hairs on the disc.

Legs black; tips of the femora, the anterior four tibiæ and the first two segments of their tarsi, and the base and apex of the hind tibiæ, yellow.

Wings cinereous hyaline, somewhat yellowish on the basal portion anteriorly. Squamæ white, with yellow border and fringe. Halteres yellow.

Abdomen black; second segment with a pair of large yellow spots, rounded interiorly, directed forward laterally so that they touch the anterior margin towards the sides, more or less narrowed laterally, so that the black hind margin may be produced forward along the lateral margin as a narrow triangle, sometimes as a truncate projection. Third segment with a broad, complete basal fascia, occupying at least half, sometimes four-fifths the length of the segment on each side of the median notch, considerably or moderately narrowed towards the sides, never going over the side margins in more than half the length of the segment, sometimes only narrowly at the anterior angles. Fourth segment variable, sometimes all black, but most frequently with the apex obscurely, a triangular spot on the anterior angles and a pair of narrowly separated triangular spots on the middle at the base, reddish yellow, or all of these markings may be more or less fused, the central black stripe usually distinct. Hypopygium usually reddish. Pile bright yellow, black on the black areas, and a median longitudinal stripe on the fourth segment.

*Female*. Front rather narrow, moderately narrowed above; yellow on the lower fourth, elsewhere shining greenish black; thinly reddish pollinose in front of the ocelli. Pile black, longer on the ocellar triangle, yellow at the vertex.

A patch of black pile before the ends of the thoracic suture; scutellum more or less black pilose on the disc. Legs somewhat paler colored.

Abdominal bands narrower, the second and third usually narrowly inter-

rupted in the middle. Fifth segment yellowish basally, more broadly so in the middle. Pile slightly shorter throughout.

Described from twenty-eight specimens from British Columbia, Oregon and Washington. Originally described from Washington; also recorded from Alaska.

This species is readily distinguished from *humeralis* by the black pile on the thorax and the shape of the abdominal markings.

### 89. *Cynorhina umbratilis* Williston.

(Plate VIII.)

*Criorhina* (*Cynorhina*) *umbratilis* Williston, Synopsis, 212.

Face black in ground color; except a median stripe and the cheeks, densely covered with greyish white pollen which obscures the ground color; eyes distinctly separated; abdomen yellow on the sides basally.

Length, 9 to 10 mm.

*Male*. Head shining black in ground color; a moderately broad longitudinal facial stripe, the cheeks, a quadrate area on the upper portion of the antennal prominence, and the front above the transverse groove, shining; elsewhere the ground color is obscured by greyish white, somewhat silvery pollen. Face in profile somewhat produced anteriorly below, receding below the antennal prominence, thence almost directly produced to the small tubercle, below which it is perpendicular or slightly receding. The face is produced considerably below the lower border of the eyes and is subconical. Cheeks without pile. Facial side margins with short, the sides opposite the antennæ and the upper portion of the frontal triangle with longer, fine whitish pile. Ocelli equidistant. Vertical triangle and upper portion of the occiput with fine white pile; on the lower portion of the latter the pile tinged with yellow. Antennæ brownish red or piceous, the third segment slightly silvery. Arista luteous, darker apically. The front is very slightly narrowed from the vertex to the transverse depression.

Thorax and scutellum shining black, covered with fine, pallid, yellowish pile; across between the roots of the wings with a broad band of black pile. Humeri and pleuræ without pollen.

Legs black; knees narrowly, more than the basal half of the hind femora, and a variable basal area on the middle ones (sometimes wanting), yellow. First three segments of the anterior and four of the middle tarsi, reddish or yellow; tips of the hind basitarsi and the two following segments of the same color.

Wings, especially beyond the middle, tinged with luteous or light brownish. Stigma luteous. Stigmatal cross-vein incomplete. Squamæ slightly fuscous, the border darker, the upper lobe with brown, the lower with pallidly brown or cinereous fringe. Halteres yellow, the stem more reddish.

Abdomen shining black. Second segment with a large, subtriangular, bright yellow spot on either side, occupying the full length of the segment laterally and over one-third the width anteriorly, the inner ends rounded. The black portion is narrow anteriorly as the yellow quite touches the anterior margin in almost its full width, the black expanding posteriorly, but being broadly separated from the lateral margins; it may be likened to an inverted fruit dish. On the sides of the third segment the yellow occupies about one-sixth

the width of the segment anteriorly and gradually decreases in width until at its apex it occupies usually not more than one-tenth the width. The pile on the yellow markings is longer and more dense than elsewhere; on the basal one and one-half segments, broad triangles on the third and fourth segments and a fringe on the apex of the third segment, whitish yellow, appearing yellow on the yellow areas; elsewhere, including the genitalia, black.

*Female*. Front moderately broad at the vertex, gradually widening below; scarcely pollinose on the lower half; pile whitish, with scarcely any yellowish tinge. Pile on the abdomen more yellow and the yellow pile somewhat more extensive.

Described from ten specimens from New Jersey, Mississippi, North Carolina and Kansas, April to June.

A very distinct species, the bright yellow markings and long, wholly black face rendering recognition easy.

## GENUS CRIORHINA Meigen.

*Milesia* subgenus *Criorhina* Meigen, Syst. Beschr., iii, 236, 1822. St. Fargeau et Serville Encycl. Meth., x, 518, 1825.

*Criorhina* Macquart, Hist. Nat. Dipt., i, 497, 1834. Schiner, Fauna Austr., i, 349, 1862. Williston, Synopsis, 209, 1886. Verrall, Brit. Flies, viii, 1901. Lundbeck, Dipt. Dan. pt. v. 490, 1908.

*Eriophora* Philippi, Verh. Zoöl.-Bot. Ges., xv, 736, 1865.

*Brachymyia* Williston, Can. Ent., xiv, 77, 1882.

*Eurhinomallota* Bigot, Bull. Soc. Ent. Fr., 1882, No. 6; Annales, 1883, 225.

Head more or less triangular in shape; face produced downwards and somewhat forwards, bare except on the side margins, and rarely on the slopes; ground color black. Eyes narrowly separated in the male. Thorax and abdomen black in ground color, usually more or less pollinose, but the latter often lacking pollen; usually with very long, dense pile. First posterior cell acute apically, as the apical cross-vein joins the third longitudinal vein close to the costa; third vein almost straight, joining the costa slightly before the tip of the wing; anterior cross-vein very oblique, joining the third vein beyond the middle of the discal cell. Legs usually stout, the hind femora often thickened and arcuate; hind tibiæ more or less arcuate; legs of females more slender. Bumblebee-like flies.

As far as our North American species are concerned there should be no trouble in deciding whether a specimen belongs within this genus or not. Our species are remarkably homologous and all closely resemble bumblebees, all possess long pile and robust bodies. Several exotic species bear much shorter pile, but nevertheless are quite characteristic of the genus, which never has bright ground color on any part of the body, and this, together with the characteristic long face and shape of the head, and also the frequently thinned third antennal segment, together with its shape, will at once separate the insects from any others.

*C. berberina* of Europe is the type of the genus according to Verrall, but Macquart gave *C. apiformis,* which had already been designated the type of the genus *Pocota* by St. Fargeau et Serville, as the typical species. Verrall very satisfactorily explains his reasons for concluding that *berberina* was selected as the type species by Meigen. At any rate the genus is a natural one and the name seems well established.

## SYNOPSIS OF THE SPECIES.

1. Mystax or tuft of hairs present above the anterior margin of the oral cavity ..... 2
   Mystax wanting ..... 4
2. Abdomen black pilose beyond the second segment.....*mystacea* n. sp.
   Abdomen not wholly black pilose beyond the second segment..... 3
3. Pile on the postalar calli, scutellum and sides of the apical abdominal segments whitish (anterior tarsi not unusually broadened?) *quadriboscis* Lovett
   Pile on these areas reddish or bright yellow, especially on the thorax; anterior tarsi peculiarly flattened.....*luna* Lovett
4. Ocelli equidistant in both sexes (if female does not belong here see couplet 9); rarely over 15 mm..... 5
   Anterior ocellus remote; usually over 15 mm..... 9
5. Scutellum wholly black pilose..... 6
   Scutellum yellow pilose, but sometimes with scattered black hairs..... 8
6. Sides of third and fourth abdominal segments with yellowish pollen; third segment reddish pilose; pile of the face yellow..*coquilletti* Willist.
   Sides of the third and fourth segments without pollen; if with pollen, then the face bears black or brown pile on the sides..... 7
7. Fourth segment wholly yellow or tawny and yellow pilose; face with yellow pile .....*lupina* Williston
   Fourth segment with black pile on the basal third; face with black or brownish pile .....*grandis* Lovett
8. Face with pile on the slopes: second abdominal segment opaque black except the sides .....*nigripes* Williston
   Face without pile except along the eyes; second abdominal segment extensively greyish pollinose anteriorly.....*tricolor* Coquillett
9. Fourth abdominal segment densely yellow pollinose, shorter than usual, *aurea* Lovett
   Fourth segment not wholly yellow pollinose, but often aëneous..... 10
10. Posterior femora greatly enlarged and considerably arcuate; postalar calli black pilose except the hairs on the outer side.....*caudata* n. sp.
    Posterior femora not greatly enlarged and only slightly arcuate or the postalar calli wholly yellow pilose ..... 11
11. Abdomen wholly black pilose beyond the second segment, except sometimes a few scattered hairs apically; tibiæ chiefly black in ground color ..... 12
    Abdomen with conspicuous reddish or yellow pile beyond the second segment ..... 13
12. Thorax wholly yellow pilose, or with a narrow, incomplete black pilose band between the roots of the wings; face of the male perpendicular below the tubercle; middle of the second abdominal segment with short black or brown pile, appearing almost bare .....*nigriventris* Walton

Thorax with a broad black pilose band between the roots of the wings; pile of the second abdominal segment more densely and extensively yellow ..... *intermedia* Johnson

13. Tibiæ reddish, with a median blackish band, the hind ones ending in a spurlike lobe; dorsum of the thorax with some yellow pile before the scutellum; third and fourth abdominal segments with some reddish pile basally; hind femora considerably thickened and arcuate; legs chiefly yellow pilose; abdomen of male somewhat tapering ..... 14

Tibiæ not so distinctly spur lobed; third abdominal segment always black pilose at the base; hind femora less enlarged..... 15

14. Abdomen with black pile on the apices of the third and fourth segments ..... *verbosa* Harris

Abdomen wholly without black pile on the bases of the third and fourth segments ..... *verbosa-aurata* n. var.

15. Middle femora with a basal patch of dense, reddish pile; hind femora a little enlarged, not much arcuate; third abdominal segment black pilose, the fourth yellow pilose..... *latipilosa* n. sp.

Middle femora without red basal patch, but the anterior femora with one; pile of the femora chiefly yellow, reddish apically on the hind pair; third abdominal segment with a narrowly interrupted, abbreviated broad opaque band beyond the middle; hind femora rather slender and only slightly curved..... *kincaidi* Coquillett

## 90. *Criorhina quadriboscis* Lovett.

*Criorhina quadriboscis* Lovett, Proc. Cal. Acad. Sci., (4) ix, 250.

"*Female*. Length, 12 mm. Face unusually produced, heavy, blunt, square at proboscis; lower eye margins but little more than one-half distance to tip; slightly concave below antennæ; tubercle reduced; concave from tubercle to margin; golden pollinose, with elongate golden pile along the eye margins and a tuft at the oral margin; front and vertex dark brown, with golden pollen and dark brown pile; a deep median suture about ocelli extending down to antennal prominence; cheeks shining black, bare, below and along the occiput, golden pruinose with light yellow pile. Antennæ small, dark brown; first two segments equal; third broad, rounded, flattened, lighter at base. Arista dark brown.

"Thorax black, golden pruinose, on anterior half with light pile, a shining black band dorsally with black pile; postalar callosities with elongate white pile; scutellum black, with conspicuously elongate white pile.

"Legs brown; femora dark, lighter proximally and apically, tibiæ similar, but lighter throughout; tarsi dark at tip. Pile on front and middle femora light at base, black at tip; on hind femora mostly coarse black with scattering lighter hairs, tibiæ and tarsi with short golden pile.

"The wings appear twice the length of the abdomen, smoky, veins dark brown throughout; stigma yellow.

"Abdomen black, subopaque on first two segments; light yellow pilose, thin and short on disc; third segment shining black, orange pilose on disc, outer angles black pilose; fourth segment shining black, conspicuously elongate orange pilose; on anterior lateral angles, but not reaching the lateral margins, are two pruinose crescentric spots; the lateral margins with elongate whitish pile; fifth segment shining black, elongate black pilose." (Lovett, *l. c.*)

The species was described from a single female collected at Mount Jefferson, Oregon, April, 1916. It belongs to the small group which is distinguished by the presence of a mystax or group of hairs just above the anterior mouth edge. It appears very close to *luna*, but may be distinguished by the lighter-colored pile on the postalar calli and scutellum and the sides

of the third segment. The tarsi are not mentioned, but are apparently normal and not flattened as in *luna*, and if this is the case a really definite character separates them. I can see no difference in the shape of the face in comparing a female of *luna* with Lovett's figure, and as there is considerable variation and the face of the female is always more conspicuous and produced forward than in the male, this character is hardly of value, unless the face is also unusually shortened. The proboscis is hardly chitinized enough to be of great value.

### 91. *Criorhina luna* Lovett.

(Plate VIII.)

*Criorhina luna* Lovett, Proc. Cal. Acad. Sci., (4) ix, 249.

A mystax above the anterior oral margin; a black pilose band across the thorax; tarsi red, the anterior ones flattened; abdomen largely red pilose; hypopygium black pilose.

Length, 19 to 21 mm.

*Male*. Face and front thickly yellow pollinose, obscuring the ground color. Face moderately excavated below the antennæ, subtuberculate a little above the middle, below which it is perpendicular to the anterior oral margin; a rather strong reddish mystax overhangs the tip of the oral margin. Cheeks black, with sparse, black pile; facial side margins with bright yellow pile. Front shining above the antennal base, with black pile on the apical half of the antennal prominence. Vertical triangle dull, long, with black and red pile intermixed. Anterior ocellus remote. Occiput densely yellow pollinose, with yellow pile, the occipital ciliæ black. Eyes rather narrowly separated. Antennæ brown, basal segments more blackish, the third red on the basal fourth or more; upper apex of the third segment angular, the lower end sharply rounded; the apex crescentric, thinned.

Thorax before the suture and the pleuræ in the middle densely yellow pollinose; in the middle with two narrowly separated dark longitudinal stripes and an obscure darker area in front of the inner ends of the suture. Dorsum behind the suture with a large, median, diffuse subopaque area and narrow opaque stripes on each side of it; pile before the suture, on the pleuræ in the middle, on the postalar calli and the scutellum, long, yellow; behind the suture and under the base of the wings, long, black. Scutellum æneous.

Legs black; tarsi orange red, the last segment reddish brown; knees and apices of the tibiæ reddish. Pile of the femora long, yellow, on the apices black; on the hind ones below, reddish. Pile of the tibiæ and tarsi short reddish yellow or reddish. Front tarsi flattened and broadened, the basitarsi slightly excavated posteriorly.

Wings fuscous yellow, paler posteriorly; stigma luteous, a darker diffuse spot behind the base of the stigma. Squamæ brownish with brown fringe. Halteres red, the knob brown.

Abdomen shining black; first segment brown, with fine, short, cinereous pile. Basal angles of the second segment greyish or greyish yellow pollinose. Pile of the second segment long, yellow, on the posterior margin red; third and fourth segments with red pile; hypopygium black pilose. The color of the pile varies somewhat.

*Female*. Front with the pollen more reddish; a conspicuous longitudinal

depression before the ocelli. Anterior ocellus remote; pile black and yellow intermixed; third antennal segment a little more rounded.

Pollen of the thorax produced back in the middle, sometimes to the scutellum, which is thinly pollinose. The fourth abdominal segment has the anterior angles broadly triangularly pollinose. Fifth segment short, with black pile.

Described from male, paratype, Mary's Peak, Ore., May 14 (A. L. Lovett); male, Tillamook, Ore., May 24 (M. M. Young); female, Ucluelet, British Columbia, June 5; male, Wellington, British Columbia, May 17; two males and one female, Vancouver, British Columbia, March 20, 24, April 10. In addition I have seen several specimens in the Canadian national collection, Ottawa.

Readily distinguished from *mystaceæ* and *quadriboscis* by the arrangement of the pollen on the abdomen, the short fifth segment, etc.

## 92. *Criorhina mystaccæ* n. sp.

(Plate VIII.)

Length, 20 mm.

*Female.* This species is sufficiently characterized by the presence of a mystax and the black pilose abdomen beyond the second segment. The face is a little more produced than in *intermedia.* The front is shining on the upper side of the antennal prominence, elsewhere rusty brownish pollinose; pile brown, shorter across the middle, yellow at the vertex. Pile on the sides of the face and lower half of the occiput brown or blackish.

Thorax and scutellum as in *intermedia.*

Abdomen as in *intermedia.* All the segments beyond the second deep shining black, with black pile.

Holotype, an unique female, Halifax, Nova Scotia, June 13, 1915 (J. Perrin). The specimen is in the Canadian national collection, Ottawa, Canada.

The nearest ally is evidently *luna* Lovett, from which the absence of red pile and pollen beyond the second abdominal segment and shorter more prominent face will at once distinguish it. The mystax in the type has been largely broken off, but the short stubs of hairs remain; it appears brownish.

## 93. *Criorhina verbosa* Walker.

*Milesia verbosa* (Harris) Walker, List, iii, 568.
*Musca tomentosa* Swederus, Vetensk. Ak. Nya Handl., 1787 (O. S.)
*Brachypalpus verbosa* (Harris) (Walker) O. S., Cat. 136.
*Criorhina verbosa* (Harris) (Walker) Williston, Synopsis, 211.

Face short; thorax with yellow pile immediately before the scutellum; second abdominal segment chiefly subopaque greyish with a transverse H-shaped dark marking; third segment with an elongate opaque triangle on the base.

Length, 16 to 20 mm.

*Male.* Face greyish yellow pollinose with a whitish reflection; rather short, the concavity moderately deep, occupying the upper half; tubercle small, below which the face is slightly receding. Side margins rather dull, coarsely punctured, not concave. Cheeks shining black. Side margins, the lower sides of the antennal prominence and the cheeks sparsely pale yellow pilose.

Frontal triangle with similarly colored pollen to that of the face; a large triangular area from the apex of the antennal prominence extending narrowly to the shining space between the eyes, more or less shining black. Pile yellow or fulvous. Vertical triangle slightly shining, with fulvous pile. Occiput with brownish red pollen, silvery greyish next to the eyes; pile yellowish below, yellowish to fulvous above; occipital ciliæ not distinct. First antennal segment shining black or deep brown, second reddish, third brown, with the base more or less reddish; third segment obliquely transverse, twice as wide as long, the end wholly thinned, the concavity rather broad; above subangular, below obtusely rounded. Arista brown.

Thorax before the suture greyish yellowish pollinose, leaving a pair of narrowly separated median longitudinal stripes and a transverse area before the inner ends of the suture darker; pleuræ greyish pollinose in the middle. Behind the suture the dorsum opaque black, with a pointed, shining vitta extending back from the inner end of the suture, the lateral margins broadly, and the posterior margin more or less, shining. Postalar calli mostly aëneous. Pile before the suture, on the pleuræ, the postalar calli and across just before the scutellum, long yellow or reddish yellow, leaving a broad band between the roots of the wings black pilose. Scutellum shining black, with aëneous indications on the apical portion, its pile yellow or reddish yellow.

Femora shining black, their apices reddish; tibiæ reddish, with a broad black band situated mostly beyond the middle; tarsi reddish, the last one or two segments darker. Pile of the femora long, yellowish, some black pile towards the apices above; beneath the hind femora with short, stout, black pile; tibiæ and tarsi with short fulvous pile. Hind femora considerably enlarged, somewhat arcuate; hind tibiæ arcuate and ending in a spurlike lobe on the inner side.

Wings faintly yellowish; stigma luteous. Squamæ whitish, the lower lobe with a yellow border and fringe, the upper with brown border and fringe. Halteres yellow, the knob brown.

First abdominal segment brownish with an overlying greyish cast. Second segment densely yellowish greyish pollinose, the posterior angles shining black; the base, not reaching the sides, and a rather broad median stripe extending to the posterior margin which is also blackish; this leaves the black in the shape of an H lying on its side. Third and fourth segments metallic black, the third with an opaque black, elongate, subbasal triangular streak extending three-fourths the length of the segment. Sides of the third and fourth segments and posterior angles of the fourth with whitish yellow, sometimes almost white, pile. Pile short, yellow, on the first segment; long, yellow on the second; third segment usually with the basal half reddish pilose, sometimes yellow, or the pile may be all yellow except on the posterior margin; usually the posterior half of the segment (more or less) with black pile; the disc of the fourth segment may be wholly black pilose except the base, which bears yellow or reddish pile, but the pile may be all reddish or yellowish. Hypopygium with black pile.

*Female.* Median facial stripe broad, shining, not reaching the antennal prominence. Front shining blackish, the sides rather broadly reddish pollinose. Front bright yellow pilose, but some blackish hairs above the antennæ. Anterior ocellus a little remote.

Tibiæ less broadly black; hind legs slender, the femora not arcuate, the tibiæ only slightly so.

Second abdominal segment wholly pollinose, the base and a slender median line on the anterior half obscurely black. Pile of the third and fourth segments variable, but usually reddish basally and black apically. Pile of the fifth segment black.

Sixteen specimens from Pennsylvania, one specimen from Manitoba, nine from Ohio, all collected from April to June.

This species is much like *caudata,* but may be distinguished by the pollen on the second abdominal segment, the absence of transverse opaque markings on the third segment, the more rounded oral angles, etc.

### 93*a*. *Criorhina verbosa* var. *aurata* n. var.

This variety differs from the typical form in that the pile on the disc of the third and fourth abdominal segments is bright golden reddish. There is no trace of black pile on the abdomen except on the genitalia, which is almost all black pilose.

Holotype, male; Hummelstown, Pa., April 4, 1917; collected by J. N. Knull. The type is in the collection of the Bureau of Plant Industry, Harrisburg, Pa. Paratype, male, Winnipeg, Manitoba; May 23; in the author's collection.

### 94. *Criorhina intermedia* Johnson.

*Criorhina intermedia* Johnson, Psyche, xxiv, 153.

Thorax yellow pilose with a black pilose band across between the roots of the wings; middle of the second segment with tawny or yellow pile.

Length, 17 to 19 mm.

*Male.* Face densely yellowish grey pollinose; rather deeply excavated on the upper half, tubercle small; below the tubercle the face slightly produced to the tip of the oral margin; side margins a little concave. Cheeks shining black. Sides of the face and lower sides of the antennal prominence with yellowish pile, some black hairs on the lower half and on the back of the cheeks, cheeks bare in front. Frontal triangle with brownish greyish pollen, the apex of the antennal prominence and a median longitudinal impressed line, shining brownish, the pile yellow. Vertical triangle black, thinly greyish pollinose, the pile yellow. Anterior ocellus a little remote. Occiput moderately greyish pollinose, with brownish pile on the lower half, yellowish pile above. Antennæ with the first segment shining black, the second red, third brown, with the base reddish; third segment not twice as wide as long, the ends almost evenly rounded, apex wholly thinned, the concavity broad. Arista brown.

Thorax greyish pollinose before the suture and on the middle of the pleuræ, on the dorsum with three obscure, slightly olivaceous stripes. The pollen does not reach the posterior ends of the suture, but runs in a straight line across the disc to the lateral ends. Behind the grey area the thorax is opaque black, with a very slender median, wider stripes on either side, and the lateral margins broadly, shining black. Scutellum moderately shining greenish black. Thorax before the suture, on the pleuræ, postalar calli and the scutellum, with long, dense, yellow pile; posterior half of the dorsum black pilose.

Legs black; tips of the anterior four tibiæ and all the tarsi, reddish, the apical tarsal segment somewhat brownish; knees brown or piceous. Pile of the femora black, on the posterior basal two-thirds of the anterior four, often yellow. Tibiæ with black or brown pile; anterior tibiæ with tawny pile in front. Tarsi with brownish bristles.

Wings slightly brownish, the veins all clouded. Stigma luteous. Squamæ brownish, with brown fringe. Halteres brownish, the knob slightly lighter.

Abdomen shining deep black; first segment brownish black, with short yellowish and brown pile. Second segment subshining, with an overlying greyish cast; a narrow, abbreviated basal fascia, a broad median stripe, expanding behind the middle of the segment into a broad, abbreviated fascia, subopaque black, the posterior margin of the segment somewhat reddish. Pile of the second segment yellow at the sides, fulvous on the disc, not so abundant on the anterior median portion of the segment; pile on the third and fourth segments long, black, with some yellow hairs intermixed on the end of the fourth or wholly without yellow pile beyond the ends of the second segment. Hypopygium black pilose.

*Female.* "The female has the front about one-fifth the width of the head, dusted with brown and with brownish hairs, face yellowish pollinose, with a wide facial stripe." (Johnson, *l. c.*) The size of the species is given as 12 to 16 mm.

Four males from Ontario and New Hampshire. These agree perfectly with Johnson's description, but are all larger. Originally described from New Hampshire and Massachusetts.

It is difficult to readily distinguish this species from *nigriventris*, but in that species the second segment is black pilose except the posterior angles, and the middle of the segment appears almost bare. Usually in that species the thorax is wholly yellow pilose, or the band between the roots of the wings is very narrow. It is much easier to separate the species when they are before one than to draw up characters which will prove sufficiently clear to enable ready determination.

### 95. *Criorhina nigriventris* Walton.

*Criorhina nigriventris* Walton, xxii, 319.

Thorax wholly yellow pilose, or with only a narrow black pilose band between the base of the wings; abdomen entirely black pilose except on the sides of the second segment.

Length, 16 to 20 mm.

*Male.* Cheeks and upper portion of the antennal prominence shining black. Face densely greyish yellow pollinose, concealing the ground color; in profile, deeply concave on the upper half, the lower half almost perpendicular, about as prominent as the tip of the antennal prominence, a little swollen just below the concavity. Frontal triangle with reddish pollen; facial side margins, the antennal prominence on the sides below and the apex above, with long black pile. Vertical triangle shining black, black pilose anteriorly, yellow posteriorly. Eyes moderately separated and not approaching each other as much as usual. Anterior ocellus remote. Occiput rusty yellow pollinose, with black or brown pile, above with yellow pile. Antennæ piceous black, third segment somewhat reddish basally, its apex moderately convex, the upper and lower angles sharply rounded, the end broadly thinned. Arista brown.

Thorax yellow pollinose in front, more evenly so than usual, but on the disc the pollen ends well before the inner ends of the suture; mesopleuræ with similar pollen. Posteriorly the thorax is deep shining black, with a broad median and broad stripes about half way between this and the lateral margins opaque, the stripes not coalescing posteriorly, extending forward to the yellow pollen anteriorly. The pile in the two specimens before me is wholly long, yellow; in the type there is some black pile between the roots of the wings, but the stripe is not complete. Scutellum shining greenish black, with yellow pile.

Legs black, anterior knees obscurely, apices of the tibiæ narrowly and the basal two or three tarsal segments, deep reddish, the apical segments more blackish. Pile of the legs entirely blackish, the foot cushions reddish. Posterior femora arcuate, moderately swollen, less so than in *verbosa;* hind tibiæ arcuate, but slender.

Wings tinged with luteous; stigmatal cross-vein almost complete. Squamæ fuscous, the upper lobe brown, the lower with bright yellow fringe. Halteres fuscous, the knob blackish.

Abdomen shining deep black. First segment more or less aëneous, with short brownish pile. Second segment with a narrow, median longitudinal stripe united with an incomplete transverse black, opaque, fascia which occupies almost the posterior half of the segment in the middle, but is much narrowed laterally; apex of the segment shining black. The subquadrate spots left before the opaque band appear aëneous yellow pollinose and are yellow pilose, but the pile of this color does not reach the sides, and the pile on the middle of the segment is very short, sparse, black. Elsewhere on the abdomen the pile is black, or with a brownish tinge. On the third segment there is a pair of slender, narrowly separated median longitudinal stripes which have a slight indication of spreading laterally, but this may not be characteristic of a larger series.

*Female.* This sex has not previously been described. Face shallowly concave above, the greatest concavity just below the antennal prominence, thence almost straight to about the middle of the face. Median shining black stripe moderately broad. Pollen rusty reddish; similar colored pollen extends broadly up the sides of the front and is united in a broad band across the middle. Pile of the front reddish brown, or chiefly tawny; black above the antennæ, yellow above.

The pollen on the thorax is very evenly applied and extends a little farther back than in the male.

Wings lightly rich brownish luteous, less so posteriorly.

Abdomen deep shining black. Opaque fascia of the second segment slightly narrower, of about equal width throughout, leaving a broad, transverse, interrupted, lightly yellowish pollinose aëneous band in front. Third segment with just the inner half or less of this band pollinose and with subopaque instead of opaque markings limiting it. Abdominal pile wholly black or as in the male.

Described from: male, Rockville, Pa., April 24, 1913; female, Harrisburg, Pa., May 10, 1912, both collected by A. B. Champlain; female, Lyme, Conn., May 6, 1918 (W. S. Fisher). The first-mentioned female may be considered as typical.

### 96. *Criorhina latipilosa* n. sp.

(Plate VIII.)

Thorax black pilose behind the suture, except the postalar calli; abdomen yellow pilose except the third segment; fourth segment aëneous; middle femora of the male with a patch of orange red hairs basally; legs of the female all black pilose, except a few long yellow hairs behind the anterior four femora, and the reddish tarsal pads.

Length, 20 mm.

*Male*. Face yellowish reddish pollinose, the median area less densely so; moderately concave on the upper half, the tubercle rather large, rounded, perpendicular below the tubercle; sides of the face with long brown pile which becomes yellow on the lower sides of the antennal prominence. Cheeks shining blackish, below the eyes with brown pile. Frontal triangle with brownish yellow pollen; apex of the antennal prominence reddish; some brown pile on its apical portion. Vertical triangle dull, with yellow pile, some black hairs in front. Anterior ocellus remote. Occiput greyish pollinose, more yellowish below, with brown pile below, yellow above. Occipital ciliæ black. Antennæ black; first segment shining; second more brownish or piceous; third brown, its base red; twice as wide as long, subangulate above and below, its end a little concave, wholly thinned, the concavity not wide.

Thorax greyish yellow pollinose before the suture, with three obscure brownish stripes; behind the suture opaque black; the side margins broadly, and a submedian pointed stripe, shining. Pleuræ thinly yellowish pollinose. Pile before the suture, on the pleuræ, postalar calli and scutellum, long, yellow, sometimes a few yellow hairs immediately before the scutellum. Pile long, black, behind the suture.

Legs brown; knees, apices of the tibiæ and the tarsi, reddish or piceous. Long pile of the front femora yellow, the shorter pile brick red; long pile of the middle femora black, with some yellow hairs intermixed, the shorter pile yellowish or reddish, a tuft of bright orange red pile at the base. Hind femora with long black pile, some yellow hairs intermixed, more especially apically. Tibiæ with reddish pile. Hind femora slightly arcuate, not nearly as much swollen as in *verbosa;* tibiæ moderately arcuate.

Wings somewhat luteous, the veins more clouded. Squamæ brownish, with brown fringe. Halteres red, with brown knob.

First abdominal segment brownish, with short yellow pile. Second segment greyish pollinose, with a transverse H-shaped opaque black area resting on the base; third shining deep black; fourth aeneous. Pile of the second and fourth segments long, yellow, except just the apex of the former; of the third, long, black, a small black pilose area just on the anterior angles of the fourth segment. Hypopygium with black pile.

*Female*. Pollen golden yellow on the face, the median shining stripe rather broad; front with mostly red pollen and brown pile, which is shorter and a little lighter colored across the middle. Ocelli equidistant.

The legs lack the red pile on the femora and there are fewer yellow hairs, fifth abdominal segment wholly yellow pilose.

Holotype, male, Columbia Falls, Mont. (N. K. Bigelow); allotype, female, Trenton, Ontario. Holotype in the Ontario Museum, Toronto, Ontario; allotype in the author's collection.

This is another species which it is difficult to distinguish easily by any outstanding characteristic. The yellow pilose abdomen, except the third segment, will distinguish it from all but some specimens of *kincaidi*, and from these it may be separated by the reddish pad on the base of the middle femora in front; while in *kincaidi* this patch is missing on the middle femora, it is present on the front and hind ones. The two species are very much alike in structure, but *latipilosa* is shorter and more like *intermedia* in shape.

## 97. *Criorhina kincaidi* Coquillett.

(Plate VIII.)

*Criorhina kincaidi* Coq., Proc. U. S. N. M., xxiii, 611.

Very large. Thorax black pilose behind the suture; abdomen with the third segment all black, or largely reddish pilose; hind femora a little thick, but of equal width throughout, a little arcuate.

Length, 19 to 21 mm.

*Male*. No mystax. Face densely greyish yellow pollinose; cheeks shining black. Face shortly and moderately concave on the upper two-fifths, receding below the moderately conspicuous tubercle to the oral margin; tubercle produced about as far forwards as the antennal prominence. Lateral depressions not extending distinctly above the highest point of the tubercle. Sides of the face, lower sides of the antennal prominence, and the cheeks, with fine, long yellow pile. Frontal triangle greyish yellow pollinose, the prominence less densely so, with fine, long yellowish hairs. Vertical triangle dull, except the margin, with yellow pile. Anterior ocellus remote. Occiput thickly rusty reddish pollinose, with yellow pile, the occipital ciliæ black. Antennæ black; third segment reddish, except dorsoapically, the apex slightly convex, upper angle sharply rounded, the lower more rounded. Arista blackish.

Thorax aëneous before the suture, with five or seven longitudinal opaque stripes, all but the median ones narrow. Posterior half of the thorax deep black, the opaque stripes coalescing so that the disc is chiefly opaque. Pile before the suture, on the pleuræ, most of the postalar calli and on the scutellum, long, yellow; on the posterior half of the dorsum and on the pleuræ below the wings, deep brown or black. Scutellum deep shining black.

Femora black, their apices reddish; tibiæ brown, their ends reddish; tarsi reddish brown. Pile of the femora, long, yellow; above, especially basally, with some black pile; beneath, the anterior and posterior ones with short, rusty red pile at the base; the anterior femora beneath with short reddish pile; on the end of the posterior femora above with some tawny pile, and black pile before this. Tibiæ tawny pilose, the tarsal pads brick reddish. Hind femora slightly arcuate, a little thickened; their tibiæ moderately arcuate. Anterior tarsi much more slender than in *luna*, the basitarsus simple.

Veins of the wings clouded with luteous. Stigma yellow. Squamæ brown, with brown fringe. Halteres red, the stem brown.

Abdomen shining deep black, the fourth segment aeneous. First segment brown, with short yellow pile; second opaque black; third with a broad, opaque, narrowly interrupted fascia on the disc behind the middle, broadly separated from the lateral margins, sometimes only subopaque and often not completely interrupted in the middle and more or less diamond-shaped. Pile variable; densely long yellow on the sides of the second segment, sparse

across the middle of the segment in front; on the posterior margin of the second, sometimes the third wholly, at other times only the anterior angles, or with a narrow basal band, broader laterally, and the narrow base of the fourth segment, black pilose; disc of the third segment elsewhere, and sometimes more or less so, the basal disc of the fourth, with reddish or bright fulvous pile, the fourth usually yellow pilose, except the base. Hypopygium with black pile.

*Female.* Face with a median shining blackish stripe, the tubercle more or less pollinose; pollen on the sides of the face and on the front reddish brown; frontal pile brown. Pile on the facial side margins, the lower sides of the antennal prominence, cheeks and lower half of the occiput, black or brownish. Anterior ocellus remote.

Postalar calli with black and yellow hairs intermixed. Second abdominal segment more or less reddish pilose on the sides. Fourth segment brassy except the narrow base, sometimes with reddish pile basally and medianly, fifth segment wholly black pilose. Third segment all black pilose, the apex of the second and base of the third similar.

Described from twenty-two specimens from British Columbia, Washington and Oregon.

In general moderately like *verbosa,* but at once distinguished by the much more slender hind femora. The female is readily distinguished from *latipilosa* by the presence of reddish pile on the abdomen. Distinguished from *caudata* by the slender hind femora.

## 98. *Criorhina caudata* n. sp.

(Plate VIII.)

Length, 18 to 21 mm.

*Male.* Face and frontal triangle densely greyish yellow pollinose. Face rather deeply concave on the upper two-fifths, tubercle rather squarish, the lower part of the face perpendicular. Oral angles produced bluntly downwards and forwards so that they are almost as prominent as the anterior oral tip; facial pit not extending to the occiput below; facial side margins slightly concave below, with sparse yellow pile. Frontal prominence shining apically, with yellow pile. Vertical triangle brownish, with fulvous pile. Anterior ocellus remote. Occiput densely greyish pollinose, but more yellow contiguous to the eyes; with intermixed brownish and yellow pile below, or all yellow, and bright fulvous above. Cheeks with yellowish pile, just a few brownish hairs below. Antennæ black; second segment obscurely reddish apically; third segment reddish basally, brown apically, not twice as wide as long, sharply rounded above and below, the end moderately convex, thinned on its whole apex, the concavity rather broad. Arista brown.

Dorsum of the thorax before the suture with olivaceous yellowish pollen, with or without obscure, slender, narrowly interrupted median blackish stripes; the humeri and an irregular area before the outer end of the suture, grey pollinose; middle of the pleauræ with similar pollen to that of the dorsum. Behind the suture the ground color is opaque black, with an elongate stripe extending back from the inner end of the suture, the lateral margins rather broadly and the narrow hind margin shining or subshining black. Postalar calli shining black. Pile of the dorsum before the suture, on the pleuræ and the outer margin of the postalar calli (more or less), yellow; elsewhere deep black. Scutellum aëneous, its base black, with yellow pile.

Legs black; tips of the anterior four femora, broad bases and apices of their tibiæ and the first three tarsal segments, reddish. Hind tibiæ with the bases and apices piceous. Apical two tarsal segments reddish brown. Hind femora considerably thickened and arcuate, the end below flattened. Pile of the femora long, black; sometimes more or less yellow pile towards the bases of the anterior four femora, especially behind; hind femora below and apically with shorter red pile intermixed with the long black. Anterior coxæ with red pile; tibiæ and tarsi with short subappressed red pile.

Wings brownish about the veins; stigma yellow. Squamæ brownish, with brown fringe. Halteres red, the knob brown.

First abdominal segment aëneous black; second subshining metallic greyish, with a median incomplete, longitudinal and an abbreviated fascia beyond the middle, blackish; third segment shining black, the anterior angles aëneous, or sometimes all aëneous except the subopaque or opaque, abbreviated rather broad fascia beyond the middle; fourth segment metallic black. Pile of the first segment very short, yellow; of the second, long, yellow; of the third, yellow laterally and in front, black across the middle, sometimes mostly so, the apical half or less with red pile; the fourth segment may be entirely reddish pilose, or may be black pilose basally. Hypopygium with black and red intermixed, or all reddish pile.

*Female.* Extremely like *kincaida,* but readily distinguished by the yellow pile on the sides of the face and the subtruncate oral angles.

Face greyish yellow pollinose, a broad median stripe and the cheeks, shining black; pile on the facial side margins yellow, some black hairs on the cheeks below. Front rusty reddish pollinose; pile reddish, the ends of the hairs more or less brownish. Pile of the upper part of the vertex bright fulvous, with darker tips.

Third abdominal segment with the base aëneous, usually with yellow pile, in the middle opaque, and with a narrow or broad black pilose band, the apex narrowly or broadly reddish or yellow pilose; pile of the fourth segment all reddish or yellowish and red, the red pile in the middle of the segment, the anterior angles with black pile; fifth segment all reddish or yellow haired, rather dense.

Holotype, male, Salmon Arm, B. C., June 6, 1918 (E. R. Buckell); allotype, female, Cranbrook, B. C. (C. B. D. Garrett). Paratypes: male, Cranbrook, B. C., April 25, 1915 (C. B. D. Garrett); male, Moscow Mountain, Idaho; two females, Troy, Idaho, May 8; six females, two males, Hawser Lake, B. C.; two males, Kaslo, B. C.

This species, besides differing in having more robust hind femora than *kincaidi,* has quite different genitalia. Also it is found on the eastern slopes of the Rockies, while *kincaidi* apparently occurs on the western slopes only. While evidently related to *verbosa,* the color of the pile, shape of the face, etc., will readily separate it.

### 99. *Criorhina aurea* Lovett.

*Criorhina aurea* Lovett Proc. Cal. Acad. Sci., (4) ix, 248.

Facial concavity short, not half the length of the face; scutellum yellow pilose; anterior half of the thoracic dorsum with yellow pile; abdomen variable; fourth abdominal segment short, densely yellowish grey pollinose.

**Length, 14 to 15 mm.**

*Male*. Face and frontal triangle densely yellow pollinose; cheeks shining black. Facial concavity moderately deep, occupying the upper two-fifths, the oral margin more prominent than the antennal base. Side margins and cheeks with sparse, fine long yellow or tawny pile. Facial pits narrow, not markedly conspicuous, concave between it and the eye. A few yellow hairs on the upper side of the antennal prominence. Vertical triangle dull, mostly thinly yellow pollinose and with thin yellow pile; anterior ocellus remote. Occiput greyish pollinose, more red next to the eyes, its pile yellow, reddish next to the eyes below; occipital ciliæ not differentiated. Antennæ with the first two segments black, but the second may be piceous; third segment red, more or less blackish apically, about twice as broad as long, upper end rounded, its apex slightly convex and forming a distinct angle with the rounded basal lower portion. Apex thinned on its whole length. Arista long, slender, brown, its base more or less reddish.

Thorax with the pleuræ moderately yellow pollinose and long yellow pilose. Dorsum before the suture densely yellow pollinose, with two narrowly separated darker median vittæ which extend caudad a short distance beyond the suture, and an area before the inner half of the suture, blackish. Posterior half of the dorsum deep shining black, the disc subopaque, with a broad median, narrow submedian and diffuse, broad sublateral stripes, opaque. Postalar calli metallic. Pile yellow before the suture, on the pleuræ, postalar calli and on the scutellum, with some black hairs intermixed on the latter and just before it on the dorsum. Scutellum black, its apex evidently somewhat brassy or metallic.

Legs black; tarsi, except the apical two segments, red. Apices of the femora, bases and apices of the tibiæ and the second last tarsal segment reddish or obscurely so. Femora with long yellow pile, but black on the ends of the four posterior ones, or sometimes almost all black. Short pile of the femora and of the anterior tibiæ, black. Pile elsewhere, short, yellowish.

Wings infuscated about the veins; an indistinct spot behind the end of the auxiliary vein. Stigma yellow.

Abdomen deep shining black, the first segment brownish; second with the basal angles aëneous; fourth obscured by yellow pollen. First segment with short yellow pile, second and third long black pilose, their anterior angles with yellow pile, which may be more extensive. Fourth segment yellow pilose; a little over half as long as the third. Hypopygium with black and red pile.

*Female*. Face with a narrow median stripe, not reaching the antennæ, shining black; not so deeply excavated. Front yellow pollinose, a narrow median longitudinal stripe and the ocellar triangle, darker. Ocelli equidistant. Pile of the front wholly yellow; some black hairs below the eyes.

Abdomen not so deep black, the second segment appearing a little brownish; usually with more reddish pile across the middle of the abdomen, but the sides of the second segment posteriorly and the basal angles of the third may be black pilose, or there may be no trace of black pile here, in which case these areas bear red or orange pile. Fifth segment aëneous, with black hairs intermixed with the abundant deep red pile.

Described from the following specimens: Male, Penticton, B. C., April 21, 1919 (E. R. Buckell); female, O. K. Falls, B. C., April 24, 1919 (Buckell); female, Vernon, B. C. (Venables).

Readily distinguished from all other species by the short fourth abdominal segment in the male, and the pollen on this segment in the female, etc.

## 100. *Criorhina tricolor* Coquillett.

*Criorhina tricolor* Coq., Proc. Wash. Acad. Sci., ii, 436. Lovett, Proc. Cal. Acad. Sci., (4) ix, 251.

Scutellum and postalar calli with yellow pile; pile of the dorsum of the thorax behind the suture chiefly brown or black; abdominal pile variable; middle femora with some yellow pile; basal angles of second segment thickly greyish yellowish pollinose; fourth segment brassy.

Length, 12 to 15 mm.

*Male*. Face black, obscurely reddish above in some specimens, the ground color obscured by dense yellow pollen. Face rather angularly excavated beneath the antennal prominence, so that the deepest portion is almost level with the eyes, the lower two-fifths slightly more prominent than the antennal prominence and a very little receding to the anterior oral margin; not tuberculate; produced so that about one-third its height lies below the eyes. Cheeks shining black; facial side margins and cheeks thinly fine whitish pilose. A narrow, impressed line borders the eyes almost to the antennæ; side pits extending well above the tubercle; not concave between the pit and the border of the eye. Cheeks shining black; facial side margins, lower sides of the antennal prominence and the cheeks, fine, white pilose. Frontal triangle black, covered, except an oval area on the prominence with similar pollen to that on the face. Vertical triangle shining blackish, the ocellar triangle dull; ocelli equidistant. Pile of the ocellar swelling black. Posterior orbits thickly greyish yellow pollinose, with yellow pile, including that of the vertex; occipital ciliæ black. Antennæ red, first and second segments darker, often piceous or blackish; third segment blackish on the upper basal portion, twice as wide as long, the lower part markedly thinned, the upper three-fourths rather thin; above subtriangular, rounded below. Arista black or brown.

Thorax deep black, with more or less bronze reflection; before the suture and on the middle of the pleuræ, densely yellowish pollinose, leaving a broad, longitudinal median stripe and a rounded area in front of the inner ends of the suture, shining. The pollinose area and the postalar calli have a strong brassy reflection. Dorsum before the suture, the pleuræ and postalar calli with long yellow pile, but there may be a few yellow hairs just before the scutellum or along the lateral margins; behind the suture with long black or brown pile. Scutellum deep black, the apical half and sides strongly brassy; pile yellow, frequently more or less red on the disc or there may be a few black hairs here.

Legs deep reddish, the femora black except the apices; hind tibiæ sometimes in the middle and the last two tarsal segments, brown. Pile of the legs short, reddish; on the femora, long, black, on the bases of the anterior four, yellow, or sometimes chiefly reddish in front, yellow elsewhere, or the middle ones may be black pilose behind.

Wings slightly yellowish; a clear area behind the stigmal cell, a slight cloud behind the base of the stigma; stigma yellow. Squamæ greyish brownish, the border more brown, with a golden brownish fringe. Halteres reddish brown.

Abdomen shining black, the fourth segment strongly metallic. First segment brassy, with short yellow pile. Second segment with the basal angles thickly greyish yellow pollinose, extending less densely across the anterior

half of the segment. Pile on the second segment sometimes chiefly yellow, but it may be all red; third segment usually wholly red pilose, but sometimes chiefly black. Fourth segment usually yellow pilose.

*Female.* Face not hollowed, but produced from the base of the short antennal prominence and slightly receding below the facial prominence. Pollen thin, greyish yellow, a narrow median stripe shining brownish; a narrow, flattened median line on the lower two-fifths, ending at the oral margin; front with a brassy reflection; pile yellow, brown on the ocelli.

The median blackish line on the anterior of the thorax is divided longitudinally by a slender brassy one. Abdomen usually more extensively reddish pilose.

Described from the following specimens: Female, Mt. Arrowsmith, British Columbia, July 29, 1903; male, Mt. Rainier, Washington, Paradise Park, August, 1917 (A. L. Melander); male, Mt. Cheam, British Columbia, August, 1899 (James Fletcher); male, Vernon, British Columbia, May 31, 1919 (W. Ruhmann); female, Seattle, Wash., April 28; male, Mt. Cheam, British Columbia, August; female, British Columbia, August; female, Eburne, British Columbia, May 23; female, Vancouver, British Columbia, April 23; female, Crown mountain, British Columbia, July 9; male, Crown mountain, British Columbia, July 9; male, Vancouver, British Columbia, April 26, 1906.

Seven of these specimens were determined by Coquillett.

This species is readily distinguished from *aurea*, with which it might be confused, by its deeply excavated face in the male, larger, dorsally more triangular third antennal segment, wholly shining and slightly longer fourth abdominal segment and the equidistant ocelli.

## 101. *Criorhina coquilletti* Williston.

*Criorhina coquilletti* Willist., Ent. News, iii, 145.

Thorax behind the suture, and the second abdominal segment wholly, black pilose; third abdominal segment with bright red, the fourth with yellow pile.

Length, 15 mm.

*Male.* Face and front black, the former densely greyish yellow pollinose, in some lights bright yellow, the cheeks shining black. Face moderately concave on the upper three-fifths, the lower part on a plane with the tip of the antennal prominence, very slightly receding, the tubercle slightly noticeable; face produced conically downwards to a distance equaling two-thirds the eye height from a lateral view. Antennal prominence polished above; frontal triangle pollinose on the sides, the pollen narrowly interrupted in the middle; brownish above the pollen. Vertical triangle brownish; ocelli red, equidistant. Occiput thickly greyish yellow pollinose. Antennæ red; third segment brownish above, about as wide as the interior length of the first two combined, not quite as long as their exterior length; subangular above, sharply rounded below, the anterior edge only a little thinned. Pile on the vertical triangle yellow, with some black hairs above; on the cheeks, long, sparse, white; on the facial margins and posterior orbits, shorter, white. Occipital ciliæ strong, black. Middle of the face and frontal triangle bare.

Thorax and scutellum metallic deep black; dorsum before the suture and the mesopleuræ, thickly yellowish pollinose, on the dorsum with two broad,

narrowly separated shining median vittæ and a broad black stripe extending halfway forward from the inner ends of the suture, shining. The ground color appears aëneous beneath the yellow pile, which extends a little caudad of the suture and onto the mesopleuræ; elsewhere the pile is black or brownish black, long and rather coarse.

Legs black; tips of the femora, bases and apices of the tibiæ and the first three tarsal segments, reddish; middle of the tibiæ and the apical two tarsal segments, brown. Pile of the femora long, black, on the anterior ones below, basally, yellow; legs elsewhere with short reddish pile.

Wings subcinereous, a dilute fuscous spot behind the apex of the auxiliary vein. Stigma pale yellowish. Squamæ brownish, with brown border and black fringe.

Abdomen shining black, the first segment brown; a broad basal area on the disc of the second, not reaching the hind margin and broadly separated from the sides; a large transversely oval area on the third segment, and the sides, more broadly in front, and a similar area on the sides of the fourth segment at the base, yellowish reddish pollinose. First segment over half as long as the second. Pile of the first segment short, brownish, yellowish at the sides; second segment and narrow base of the third, with long, black pile, but a basal arch on the disc of the second with shorter hairs; third segment with long red pile, the fourth with moderately long yellow pile.

A male specimen, probably from British Columbia, is in the Canadian national collection, Ottawa, but bears no label; a second specimen from Mt. Cheam, British Columbia, August 10 (7). Originally described from California and apparently not since reported.

This species is closely related to *tricolor*, but is distinguished by the black pilose scutellum, arrangement of the abdominal pollen, darker antennæ and facial profile. From *aurea* it is distinguished by its equidistant ocelli, black-haired scutellum, black pilose legs, different arrangement of the abdominal pollen, difference in the antennæ, etc. (See *C. grandis* Lovett.)

## 102. *Criorhina grandis* Lovett.

*Criorhina grandis* Lovett, Proc. Cal. Acad. Sci., (4) ix, 291.

"Length, 15 to 17 mm. A conspicuous black and yellow species. Black, with elongate black pile; across the thorax in front of the wings and on the fourth segment of the abdomen golden yellow pilose. Superficially resembles *Pocota grandis*.

"*Female*. Face and front dull black; tubercle and vertex bare of pollen, subshining, front and face on the sides heavily brown pollinose; cheeks shining black; pile on sides of face golden, coarser, more elongate and mixed brown and black from the antennal prominence to the eye margin; front, vertex and cheeks black pilose, elongate on the vertex and cheeks, on the latter mixed with brown. Antennæ brown, first and second segments deep, shining mahogany, subequal in length, third segment dull brownish black, lighter basally, the segment thick, about one-half broader than long, not produced materially at any angle. Arista deep brownish black. Proboscis produced, heavy and blunt.

"Thorax and scutellum black, subshining. Pile elongate, dense, yellow in front of the wings on the dorsum and pleuræ, black behind the wings and on the scutellum.

"Abdomen black, subshining, fourth segment with obscure metallic reflections; pile elongate, black; on the apical two-thirds of the fourth segment yellow; on the fifth segment elongate, coarse, mixed brown and black.

"Legs black, knees briefly reddish brown; pile on femora elongate, black, mixed with brown on the under surface of the hind ones; tibiæ and tarsi with short, golden pile; at base of hind coxæ a heavy tuft of coarse golden, brown and black pile. Wings subhyaline, veins black, with extended brownish margins.

"This species is very near *coquilletti* Williston and may prove to be a synonym. The extreme disparity in size and apparent facial and antennal differences are all that seem specific. No opportunity has been offered to compare the two." (Lovett, *l. c.*)

The species was described from two females, from Mary's Peak, Oregon. Notwithstanding the remarks by Professor Lovett, the species are quite evidently abundantly distinct, as a comparison of the descriptions will show. The pile in *coquilletti* is largely different in color: on the face the pile is rather pale yellow, while on the abdomen it is moderately different in arrangement; also there is a patch of pollen on the sides of the third and fourth segments in the male, and these should be more extensive in the female, but no mention is made of them by Lovett, and the arrangement of the pile would also indicate that they are absent. I do not think that this character would have been overlooked.

### 103. *Criorhina lupina* Williston.

*Brachymyia lupina* Williston, Can. Ent., xiv, 77.
*Eurhinomallota lupina* Williston, Proc. Am. Phil. Soc., xx, 330.
*Criorhina lupina* Williston, Synopsis, 211.
?*Eurhinomallota metallica* Bigot, Bull. Soc. Ent. Fr., 1882, 78 (Will.).

Length, 12 mm.

*Male.* Face long and rather narrowly conical, thickly pale yellowish pollinose; side margins extending to about the middle of the face, not quite reaching the occiput below. Face very little concave between the antennal prominence and the not conspicuous tubercle; below the tubercle perpendicular to the oral margin. Cheeks shining black, below the eyes with a reddish area. Side margins of the face and the lower sides of the antennal prominence long yellowish pilose, the cheeks with some scattered hairs. Frontal triangle small, pollinose like the face, the prominence brownish above, its apex reddish, without pile. Vertical triangle separated from the frontal triangle by a polished area; ocellar triangle somewhat greenish black, with yellow and black pile intermixed; ocelli equidistant. Posterior orbits greyish pollinose, with yellowish pile, the occipital ciliæ black. Antennæ ferruginous reddish, third segment twice as wide as long, rather sharply rounded above and below, the end a little convex, not at all thinned, as the whole segment is thin.

Dorsum of the thorax before the suture thickly yellowish pollinose; an interrupted longitudinal vitta and an obscure area before the inner ends of the suture, blackish and somewhat shining. Mesopleuræ and a spot below with yellow pollen. Dorsum behind the suture, and the scutellum, deep metallic black, the postalar calli obscurely reddish. Pile on the basal half of the dorsum, extending behind the suture, on the mesopleuræ, and top of the sternopleuræ, yellow; posterior half of the dorsum, pteropleuræ and the scutellum black pilose.

Legs piceous brownish; knees and middle tarsi basally more yellowish; tibiæ a little paler colored than the femora. Pile black; anterior tibiæ golden pubescent inwardly.

Wings pale luteous brownish, paler posteriorly. Stigma pale yellowish. Squamæ brownish, with brown fringe. Halteres reddish, with brown knob.

Abdomen shining black; first segment brownish; fourth segment aëneous blackish. Pile of the first segment short, brown; of the second and third, long, black; of the fourth, yellow, rather reddish yellow on the anterior angles. Hypopygium with tawny pile.

Redescribed from a type specimen labeled, "Los Angeles Co., Cal.," in Kansas University Museum.

This species is very similar in appearance to *coquilletti*, but the face is more narrowly conical and a little less deeply concave; the third abdominal segment is black pilose; there are no patches of pollen on the sides of the third and fourth abdominal segments, and the legs are more unicolorous.

## 104. *Criorhina nigripes* Williston.

*Trachymyia nigripes* Williston, Can. Ent. xiv, 78.
*Eurhinomallota nigripes* Williston, Proc. Am. Phil. Soc., xx, 330.
*Criorhina nigripes* Williston, Synopsis, 210.

Legs black, the ends of the tibiæ only obscurely yellowish red; behind the suture the thorax is black pilose, except on the postalar calli and scutellum; ocelli equidistant. Abdomen yellow pilose, except that the third segment is black pilose, and there may be some brownish pile on the disc of the second segment posteriorly.

Length, 13 to 15 mm.

*Female.* Median facial stripe broadest above, the upper end narrowed and subpointed. Cheeks chestnut brown. Facial pollen yellow; face, in profile, very prominent, conical, a little concave above the tubercle, scarcely concave below it, the tubercle not prominent. Sides of the face on over half the distance to the middle, and the cheeks, sparsely pale yellow pilose. Front broad, entirely without pollen. Ocelli equidistant. Frontal pile black, except at the vertex, less abundant before the middle. Occiput with greyish yellow pollen; with long, dense yellow pile, but the pile is black just along the eyes on the upper two-thirds. Antennæ black, third segment with yellowish tomentum; not twice as wide as long, the apex gently convex, the upper angle more sharply, the lower more evenly rounded. Arista black or brown.

Thorax aëneous before the suture and usually just before the scutellum; behind the suture, deep black. Pile before the suture, on the pleuræ, postalar calli and scutellum, yellow; elsewhere caudad of the suture, black.

Legs black; bases and apices of the tibiæ obscurely reddish. Femora with yellow pile, but there is more or less black pile apically. Tibiæ and tarsi with short reddish pile.

Wings subhyaline, all the veins bordered more or less widely with luteous or brownish. Squamæ pale fuscous, the upper allula with brown, the lower with yellow, fringe. Halteres fuscous.

First abdominal segment subopaque; second opaque, except laterally; in well-preserved specimens there is a subtriangular, thinly whitish yellow pollinose area on the sides of this segment at the base. Third segment with a broad, incomplete, subapical opaque fascia which is very broadly connected in the middle with a narrow basal one, the sides and apex of the segment shining deep black. Fourth and fifth segments aëneous, the fourth with a

small or moderately sized, indeterminate opaque black spot in the middle, this sometimes almost touching the base of the segment rather broadly. Pile on the second segment long, yellow laterally and short on the disc, but it appears brownish or blackish on the posterior median portion; third segment wholly black pilose; on the fourth and fifth segments wholly yellow or reddish yellow. Venter wholly pale yellowish pilose.

*Male*. Front wide, only a little narrowed at the middle. Pile on the frontal triangle fuscous or black; on the vertical triangle black and long; on the vertex yellow; elsewhere as in the female. Tubercle small, but conspicuous, the median bare stripe extending just over it.

Legs wholly black, slender.

Abdomen with the middle of the second segment almost bare, with short, mixed yellow and blackish pile, nearly all blackish on the apex. Third segment with rather coarse black pile, but that on the sides longer and yellow or fulvous. Fourth segment aëneous with longer yellow or fulvous pile than that on the third. Hypopygium with black, rather woolly shorter pile.

This description is drawn from a female specimen from Vancouver, two females from Washington, and four males from Vancouver, British Columbia. The species was originally described from California.

Lovett, "Oregon Diptera," 293, describes what he believes to be the male of this species, but there are certain discrepancies in his description, although it is probable that he had this species before him. The description is as follows:

"A specimen believed to be a male labeled 'Stanford University, Cal., Feb. 28, 1909,' has certain markings varying from the female as follows: Face similar; tubercle more prominent; fairly abundant elongate yellow pile from base of antennal prominence out to and extending down along eye margin. Above antennal prominence with a transverse appressed line; vertical triangle opaque. Thorax and abdominal markings similar to female except *fifth* segment with short black pile. Legs black, with elongate light yellow pile. Tarsal claws yellow at base."

In all my specimens the face is pilose except on about the median fourth, and not "along the side margins" as implied here. There is a "transverse appressed" line across the front of all the members of the genus between the narrowest point of the front, which is polished and bare, but I do not know whether this is what is meant. If the hypopygium is meant by the "fifth" segment there is no need of confusion, but otherwise the specimen must be a female. The legs are as in the female in all my specimens and not wholly yellow pilose.

Because of the unusual extent of the pile on the face, this species is of unusual interest. It would seem to show some indication of a relationship with the Eristalinæ, and such would indicate to some extent the correctness of my arrangement of the genera, in so far as this character was not noted until after the classification had been completed. On the other hand, it seems to indicate a closer relationship with the Chilosinæ, and I think that this is borne out, not only in this genus, but also in *Cynorhina* and *Cynorhinella*. It seems probable that we should keep all the tuberculate-faced species more together, but the question of dominancy of characters is an unknown quantity at present, and it is therefore impossible to determine which characters are recurrent and which are due to natural progression.

## GENUS MERAPIOIDUS Bigot.

*Merapioidus* Bigot, Bull. Soc. Ent. Fr., 1879, 64. Williston, Synopsis, 243, 1886.

This genus falls naturally into the *Criorhinini* and may be at once distinguished from allied genera by the anterior conical production of the upper end of the third antennal segment, the arista being borne at the tip of the production. The face is broad and its width is regularly slightly decreased to the vertex in the female. Eyes contiguous in the male. Face short, the middle bare. Wings as in *Criorhina*. Legs simple. Abdomen broad, rather flat.

Nothing definite is known of the biology of the single species which occurs in North America, but it is probable that the larvæ live in exuding sap, or decaying wood which is continually moist. R. C. Shannon captured specimens at flowing sap of sugar maple.

The genus was established by Bigot for the single North American species, and apparently there has never been any doubt as to its limits. Matsumura described a species, *japponicus,* from Japan in 1918, but whether this species is a true *Merapioidus* I cannot say. The genus is so well marked that I do not think it possible to make any mistake, but the fact that it has been recorded previously only from a small region in Eastern North America warrants a close investigation before accepting a species from Asia.

I believe that this genus naturally follows *Criorhina nigripes,* because of the general characters of the head in this species, and while there is apparently no close connection, the evidence is rather convincing.

### 105. *Merapioidus villosus* Bigot.

*Merapioidus villosus* Bigot, Bull. Soc. Ent. Fr., 1879, 64. Williston, Synopsis, 243.

Length, 15 to 16 mm.

*Female.* Face slightly shining black, the sides golden yellow pollinose. Cheeks shining, except along the oral margin posteriorly. Face broader than the width of one eye, with a rather large, blunt tubercle a little below the middle and a slight one just above the oral margin; moderately concave above the large tubercle. Facial grooves long, conspicuous. Sides of the face and cheeks with long, sparse, fine, pale yellow pile, the tips of the hairs cinereous. Front short and broad, with a narrow, transverse pollinose yellow band below the middle. Ocelli equidistant. Pile of the front and occiput similar in color to that of the face, but more abundant. Antennæ black, the third segment produced at the apex into a long dorsal cone which bears at its end the slender, evenly tapering arista. Eyes bare. When viewed from in front the head is broadly subtriangular.

Thorax and scutellum aëneous, the former with a pair of median, narrow, posteriorly diverging stripes and a broader, interrupted stripe on each side, all ending well before the apex, greyish. Pile whitish yellow, paler on the

pleuræ and the sides of the mesonotum posteriorly; on the disc between the wings more or less cinereous or blackish.

Legs piceous or blackish, the femora always darker; their tips and narrow bases and tips of the tibiæ, reddish. Pile pale; golden on the tarsal pads.

Wings hyaline; stigma and a cloud on the anterior cross-vein brown. Squamæ pale yellowish, with pallid fringe.

Abdomen aëneous greenish, the apical half of the second to fifth segments incompletely opaque, the opaque extending triangularly forward in the middle to interrupt the shining portion. Pile chiefly yellowish; silvery whitish basally and on the tips of the segments in some lights, and somewhat so on the sides; triangles on the apices of the segments with short black pile, longer on the apical segments.

Two specimens: "At sugar maple sap. Dead Run, Fairfax county, Virginia, March 13, 1915 (R. C. Shannon)." Professor Metcalf informs me that he took specimens in early spring on the bloom of willow in the state of Ohio. Shannon has already reported these specimens.

## GENUS SOMULA Macquart.

*Somula* Macquart, Dipt. Exot. Suppl. ii, 57, 1847.
*Criorhina* subg. *Somula* Williston, Synopsis, 209, 216.

This genus was established for the reception of *S. decora* Macquart, and no doubt can exist as to the limitations, although the genus is a hard one to define clearly. Williston treated it as a subgenus of *Criorhina*. Aldrich included it in *Criorhina* in his "Catalogue." However, it appears to be well removed from that genus and no doubt need arise as to the location of a species. It may be characterized as follows:

Antennal prominence long and slender, its length almost equal to the distance from its base to the vertex, or even longer; face perpendicular or slightly retreating, more convex retreating below; eyes narrowly separated; abdomen long, slender, rather strongly convex above; largely yellow or reddish yellow; face yellow in ground color. Very closely resembling wasps in appearance.

As far as I am aware, nothing is known of the immature stages. However, its habitat and general appearances indicate that it lives in decaying wood or exuding sap, but for that matter an insect possessing either of these habits seems to be able to alternate from one to the other as necessity demands.

Only two species are known, both from North America.

### SYNOPSIS OF THE SPECIES.

*a*. Face with a median black stripe; abdominal spots transverse and of equal width throughout.....*mississippiensis* Hull

*b*. Face without median black stripe; abdominal spots oblique and not of equal width throughout.....*decora* Macquart

## 106. *Somula decora* Macquart.

(Plate X.)

*Somula decora* Macquart, Dipt. Exot., Suppl., iii, 57, 1847. Williston, Synopsis, 216.

Length, 15 to 17 mm.

*Male.* Face and front as high as the transverse shining black area between the eyes, yellow, moderately shining; cheeks and upper part of the antennal prominence, shining black. In profile the face is almost perpendicular below the long, conical antennal prominence, with a very slight swelling in the middle; extending somewhat below the eyes; cheeks, facial side margins and the lower sides of the antennal prominence, with sparse, pallid pile. Frontal triangle bare, the black not extending to upper part of the triangle. Front above black, with black pile. Anterior ocellus remote. Occiput with yellow pollen and pile below, greyish pollen and chiefly black pile above. Antennæ black, third segment more brownish, dull; suborbicular. Arista reddish, basal, bare.

Dorsum of the thorax and scutellum aëneous, the pleuræ and pectus shining black. Humeri and mesopleuræ yellow. Pile yellow; a black pilose band between the roots of the wings, and often a black pilose area on either side before the suture. Above the base of the wings there are some stout black bristly hairs.

Legs reddish yellow, the bases of all the femora, usually the last four segments of the anterior and the last three segments of the remaining tarsi, black or brownish black. Legs all rather slender.

Wings luteous to brownish in front, subhyaline behind the fourth longitudinal vein. The fourth vein joins the third slightly before the end of the latter, while the third joins the costa moderately before the tip of the wing. Squamæ pale yellowish, with yellow fringe. Halteres yellow.

Abdomen wholly narrowly margined with yellow, except the first segment. First segment opaque black, somewhat shining laterally. Second opaque black, with a pair of obliquely placed bright yellow spots, their inner ends much larger and almost touching the anterior margin, their outer ends near the posterior angles, rounded, rather narrow. Third and fourth segments bright yellow, the base, broader laterally, and an abbreviated, subapical, rather narrow fascia and a moderately slender median and sublateral longitudinal stripes, opaque black. This leaves the yellow on the disc of the segments in the form of a broad, interrupted arched band, the outer ends narrower and somewhat rounded. Apices of the second and third segments moderately bronzed. Genitalia yellow. Abdominal pile all yellow.

*Female.* The black of the front connects in a broad, median diffuse line with the black on the upper side of the antennal prominence; bright yellow pollen extends somewhat above the transverse depression, along the orbits.

Legs a little less blackish; the last tarsal segment may be somewhat reddish.

Fifth abdominal segment with an inverted, opaque black, broad V before the apex, the ground color elsewhere bright opaque yellow.

Nineteen specimens from Ontario, Pennsylvania, Ohio, New Jersey, Maine and Massachusetts. I have also seen specimens from Quebec and New Brunswick.

This species is so distinct from the following that no comment is necessary

### 107. *Somula mississippiensis* Hull.*

Abdominal spots transverse, narrow, of almost equal width throughout; antennal prominence black above; face with median black stripe.

Length, including the prominence, 17 mm.

*Male.* Face subshining whitish yellow; on the sides thickly covered with yellowish white pollen; in the middle with a narrow black stripe running from the oral margin to over halfway along the antennal prominence on its under side; cheeks and upper half of the antennal prominence black, the frontal triangle on the sides with similar colored pollen to that on the face. Sides of the face and lower sides of the prominence with short, fine, pale yellow pile; cheeks, occiput and vertical triangle with longer yellow pile; frontal triangle bare. Vertical triangle shining black. Eyes only a little approaching. Occiput shining black, the ground color, except above, obscured by greyish and yellow pollen. Antennal prominence longer than in *S. decora*. Antennæ black; third segment brownish, suborbicular, the upper end sharper. Arista brown.

Thorax shining black, the dorsum somewhat bronzed or brassy. Humeri and a vertical, suboval spot on the mesopleuræ, yellow. Scutellum shining brassy black. Pile short, yellow, rather bright on the sides of the dorsum and pleuræ.

Legs reddish; with yellow pile, except the numerous short, black bristles below the slender hind femora. Last three tarsal segments brown. Hind femora somewhat darker above beyond the middle.

Wings brownish before the fourth longitudinal vein, hyaline behind. Squamæ whitish, with bright yellow border and fringe. Halteres reddish yellow.

Abdomen with three pairs of elongate, transverse yellow spots, the first pair on the second segment, situated chiefly before the middle, elongate oval, moderately separated from each other and broadly so from the lateral margin; second and third pairs situated on the third and fourth segments, closer to the front margin and separated from the lateral margin by about the same distance as from each other, the front margins very slightly concave, their posterior margins just a little convex, their inner anterior ends square, the posterior ones rounded off, their outer ends about evenly truncately rounded. The spots on the fourth segment are placed a little obliquely, as their outer ends are more widely separated from the anterior margin of the segment. The whole margin of the abdomen, except the first segment, is reddish and the apex of the fourth segment is broadly metallic reddish, the apices of the two preceding segments very narrowly yellowish whitish. The yellow spots are all margined by opaque black, which reaches the front margin of all the segments; the narrow apex of the second, apical fourth of the third and all the fourth segment between the narrow black margin of the spots, extending also between the spots for half their width, metallic bronze. Hypopygium red. Pile wholly bright reddish. Venter black, all the incisures broadly yellow.

This description is drawn from a paratype in the author's collection, collected by Mr. Hull at Mississippi Agricultural College, April 22, 1922, and received from him.

"*Female.* Very similar to the male. The posterior metallic band of the second segment is wanting, the yellow triangles in the upper corner of the

* Description not published at time of writing.

second segment are smaller and those on the third segment are obsolete. The hind femora lack the black bristlelike hairs on the inside." (Hull.)

There can be no confusion regarding the identity of this species, as the black facial stripe will at once distinguish it from *decora*.

Mr. Hull makes the following comment regarding the species:

"Curiously enough, the first specimen of this magnificent species, a male, was taken on May 6, 1922, Agricultural College, Mississippi, dead, but in perfect condition, from a cobweb. On March 3, 1921, a fragmentary but unmistakably identical specimen was taken from a cobweb in the same locality. Subsequently three specimens, two males and one female, have been taken by R. H. Smith on flowers of *Crǣgus* on April 2, 1922, at the college."

## NOTES ON THE BIOLOGY AND ECOLOGY OF THE SYRPHIDAE.

### EGG-LAYING HABITS.

The manner and oviposition of the syrphids is somewhat varied, and the number and position of the eggs deposited at the same time is also variable. The method of oviposition of several species of Syrphidæ belonging to widely separated genera has been studied by the author, and the observations bear out those made for other families, viz.: that forms in which the larvæ are predacious upon exposed insects usually lay their eggs singly, while the number of eggs increases until, in those forms living in more or less liquid substance, is very high and may be over 150. There are, of course, exceptions.

In the Syrphinæ, which are aphidophagous, and *Pipizini* the eggs are deposited singly upon leaves and twigs upon which aphid colonies are found. In the case of *Syrphus torvus* the eggs may be laid in anticipation of the formation of colonies, and my observation would seem to indicate that the majority of such eggs are deposited with rare discernment. Other species, which have not been determined, possess the same foresight, but less commonly.

The position of the eggs varies somewhat with different species. *Syrphus (Xanthogramma) emarginatus* Say invariably lays the eggs upon the petiole of the leaves. *Syrphus knabi* Shannon usually deposits them upon the upper surface of the leaves, where they are exposed. *Syrphus rectus* O. S. frequently deposits them upon the under side of the leaves, and this appears to be the favorite position with most species. Some do not seem at all particular, but may deposit them in various positions. The eggs are always placed upon the side and never upon end.

I have found the larvæ of *Baccha fascipennis* Wiedemann feeding upon mealy bugs in Ontario. In this case empty egg cases were found scattered about singly on the stems and leaves of the plants.

In the *Melanostomini** the eggs may be deposited singly, in pairs, or in groups of three or four placed side by side upon the stems of weeds or upon the lower leaves. *Mesogramma marginata* also deposits eggs in a similar manner.

*Eumerus strigatus* deposits its eggs singly on the stems of decomposing onions which have started growth, or in the loose soil not more than one or two millimeters from the stem.

*Helophilus* eggs are found in groups of from ten to eighty, placed on end, the eggs in more or less regular rows, usually upon twigs or tree trunks, rarely upon dried leaves overhanging stagnant water in woods, and the hatching rat-tailed maggots drop into the water. No egg parasites were found. This does not agree with Jones' observations, who had a different species before him. My species was *H. similis* Loew, while Jones had *H. latifrons*. He says in part: "The eggs were laid in clusters two rows deep, and placed one beside the other; as many as 150 were found in one cluster."

The eggs of *Eristalis* are found in moist crevices of sticks lying in water and in clusters of grass or under clumps of soil which are moist but not actually in the water. They are in irregular masses, thus being easily distinguished from those of *Helophilus*. There may be from 20 to 150 in a cluster.

The eggs of *Myiolepta* are laid in the crevices of trees from which sap is exuding, and there are usually three or four deposited at the same time, but the number appears to vary according to the amount of moisture present. The larvæ apparently do not feed entirely upon the flowing sap in many cases, as they may be found in the hollows of trees in which the greater part of the moisture is due to water. It seems probable that they also feed upon rotting wood as well, as the sap usually dries up during the summer. They are short-tailed maggots.

The eggs of *Mallota* are evidently deposited in similar places, as I have observed females at different times alighting upon the moist places, evidently in search of a convenient place in which to deposit eggs.

I have found the eggs of a species belonging to the Eristalinæ floating upon the surface of water in a hollow stump.

In the case of the aphidophagous forms the adult lights upon the twig or leaf and bends the abdomen down so that the ovipositor rests lightly upon the surface, and the egg is exuded. The process

* See Davidson, "Notes on Certain Species of Melanostoma."

takes from five seconds to one minute. Flies have been observed to walk about upon leaves and twigs, apparently seeking a suitable place, before ovipositing, for a period of as much as one minute.

*Eumerus* females alight upon the onion stem and crawl down it, or alight just at the soil and protrude their ovipositor down beneath the soil surface, the process occupying from thirty seconds to three minutes, as the flies seem sometimes to have difficulty in locating a suitable spot. In some cases the adults were observed to force the abdomen down along the stem where the soil was loose or entirely free, and eggs were found to a depth of half an inch.

Several species of *Eristalis* were observed ovipositing, and in all cases the process was similar. After locating a suitable spot, often following diligent searching for a considerable period, the female commences ovipositing, the time between each egg occupying from two to ten seconds, but usually averaging between three and four seconds, so that a batch of eggs may be deposited in from three to fifteen minutes, much variation occurring even in the same species. Usually from six to ten eggs are laid in fairly rapid succession, after which a rest takes place and the ovipositor is shifted. Often the eggs may be six or seven deep, some on their sides, some on their ends, others in various positions. The young larvæ at once burrow into the muck at the bottom of the shallow water in stagnant pools or about the edges of sluggish streams.

## THE LARVÆ.

The larvæ of Syrphidæ are naturally divided into four main types or groups, all of which are more or less connected by intermediate forms.

Type I comprises the larvæ of the Microdontinæ, and they are such peculiar creatures that the puparia, which retain the shape of the larvæ, have more than once been described as mollusks. They are elongate oval, very convex above, with a flat, creeping sole, and are almost without segmentation. They live as Synochætes in the nests of ants, termites and bees in so far as their biology is known. Groups one and two are not very widely separated, as the respiratory organs are very similar, but the general structure is vastly different.

Type II, the aphidophagous forms, are undoubtedly the most familiar of the syrphid larvæ. These forms are common in colonies of plant lice, upon which they feed. However, not all of the larvæ of this type are aphidophagous in habit, and all the injurious forms belong here. Examples of these latter are found in the injurious

narcissus bulb fly, *Merodon equestris;* the corn-feeding syrphus fly, *Mesogramma politum;* and the onion bulb fly, *Eumerus strigatus;* and also the larvæ of the genera closely related to the Syrphinæ, including the *Chilosini.*

Type III are the short-tailed maggots. In this type the caudal respiratory organs are more elongate than in the preceding and arise more apically, but they are not so long nor so distinctly telescopic as in the following.

Type IV are the long-tailed maggots which are familiar objects where outhouses are still in use. Almost all of the Eristalinæ belong to this group, the larvæ living in rather liquid media, either manure, decomposing leaves, etc., or in rotting trees and logs.

Practically all syrphid larvæ, excepting those of some species of *Merodon* and some species of *Eumerus*, are beneficial, or at least not harmful. The aphidophagous forms* are of very great importance in the control of aphids, and in some cases a single larva may devour or destroy over fifty aphids in a day, or over 530 during its existence in this stage. The majority of the members of the family are scavengers, or, in other words, take part in the disintegration of dead organic matter.

While many authors have accused *Eumerus strigatus* of being injurious to onions, and possibly narcissus bulbs, I believe they are mistaken, as investigations carried on at Vineland Station, Ontario, indicate that they are not primary invaders of onions, at least. Verrall cites several cases of injuries to onions. My investigations would seem to indicate that this insect is a secondary pest and that it attacks only bulbs which have already begun to decay. The flies were very numerous in a patch of onions set for seed-growing purposes. Many of these bulbs possessed an excess of fleshy substance, and when they grew decomposition set in about the edges, or portions of the bulb dried up. However, about forty per cent of the plants were weakly, and about these plants the adult flies were very numerous, and from ten to thirty eggs, many of them already hatched, were found about each one. The bulbs themselves contained, in addition to *E. strigatus*, larvæ of other families of Diptera, and the largest number of *strigatus* reared from a single infested bulb was nine. Notwithstanding the abundance of the adults, those onions which had secured a good start and were free from the ordinary root insects were never visited by the flies for oviposition. At the same time, at a distance of not over twenty feet, a bed of seed

* See Curran: "Observations on the More Common Aphidophagous Syrphid Flies."

onions, of about an acre in extent, was growing, and in these there was not a sign of withered tops and not a single fly could be found. Several large seed-onion fields in the neighborhood were visited, and while occasional adults were found in near-by woods, in no case could any adults be located in the patches, and certainly there was no injury due to this fly. It would seem that decomposition must already be under way before the larvæ of the flies are to be found, or, indeed, before the adults are attracted to the onions.

Another species which I believe has been erroneously considered injurious is *Mesogramma politum* Say. Riley and others have shown rather conclusively that this insect is responsible for considerable injury to corn, and it has been called "the corn-feeding syrphus fly." *M. politum* was very abundant at Vineland during several seasons, particularly about sweet corn. Believing that the insect was injurious and might develop into a serious pest, considerable time was spent in studying as much of its life history as was possible so late in the season. For such an injurious insect, it seemed most remarkable that not a single feeding puncture could be found upon the leaves or stem of the corn, even though the larvæ were extremely numerous, and the cells were examined under a high-power microscope. An examination of the mouth parts of the larvæ revealed the fact that no hooks or other rasping devices were present, nor was there anything with which the larva could have pierced the walls of the cells. The larva has been said to live upon pollen, and this certainly appears to be the case, although I think I have found only one specimen upon the stamens. The leaves of corn are admirably adapted for collecting and holding water, and just on the fringe of this water, or in other cool, sheltered places, the larvæ are most numerous, as in such places the pollen is usually very abundant. It would appear that the injury to the corn was due to the presence of the water in the cups formed by the leaves, and certainly in the case under discussion, at least, not to the larvæ of *M. politum*.

*Chilosia alaskensis* Coq. (not Hunter) has been reported by Coquillett as living under the bark of live spruce in British Columbia. Most of the species, I believe, live in rotting wood. Jones has figured the larva of *C. baroni* as feeding upon an aphid, in which case a direct connection between these two subfamilies is indicated, even without considering the *Pipizini*. He does not mention the life stages elsewhere in his treatise.

*Merodon equestris*, the European narcissus bulb fly, which is now firmly established on both the east and west coasts of North America, is the only species I have observed which is actually injurious.

The larvæ bore into healthy narcissus bulbs and do a great deal of damage. The grubs are large, rather stout, of the aphidophagous type, and the mouth parts are equipped with a pair of sharp, heavily chitinized hooks with which the flesh of the bulb is rasped. Sometimes two or three larvæ may occur within a single large bulb. The species was first reported outside, from Montreal, later from Nova Scotia, New Jersey and British Columbia, and seems to have spread southward, but it is probable that several local infections took place due to the importation of bulbs from Europe. I have observed the adults very abundantly about gardens in England and France, but did not see that the bulbs suffered greatly, although they must have. The species appears to be most common on this continent in British Columbia and California.

## THE PUPÆ.

Very little need be said regarding the pupæ; they agree wholly with the types designated for the larvæ, as they form puparia within the larval skin and therefore possess very largely the larval characteristics. *Microdon* pupæ are almost identical in shape with the larvæ, and are found within the tunnels and brood chambers of ants' nests, but usually near the entrance. The aphidophagous type differs from the larvæ in that they are broader anteriorly, are much more cylindrical, and may in some cases be strongly depressed after the middle as in the Bachini, or may be more flattened as in *Syrphus* (*Xanthogramma*) *divisa* Williston. The pupæ vary with different species, also often between genera, and may be found in the soil or upon the stems and leaves of plants. The pupæ of the short-tailed and long-tailed maggots are more nearly the shape of the larvæ, but are more obtuse and a little larger anteriorly, somewhat tapering posteriorly, their tails usually quite conspicuous. These are found either in the larval habitat or near by.

## THE ADULTS.

The habits of the adults are as diverse as their various specializations. Generally speaking, they are all beneficial, as they are found chiefly upon flowers and play a large part in the pollination of bloom. Undoubtedly their value in this connection is second only to that of bees. Oddly enough, they are found chiefly upon white flowers, only a few species commonly visiting bloom of other colors.

*Eristalis bastardi* Macquart is abundant in Ontario on the bloom of cultivated gooseberry, and I have taken specimens absolutely covered with the pollen of this flower. *Rhingia nasica* Say visits the spotted yellow flowers of touch-me-not very frequently. *Meso-*

*gramma* spp. visit wild rose and corn and also feed upon the pollen of grasses. The mauve-colored flowers of the Canada thistle, the almost white variety more especially, are favorites of many of the Eristalinæ, but these also are abundant upon orchard bloom. Cherries, plums and apricots are the fruits most preferred by syrphids, but I have taken very many species also upon apple and pear. Peach bloom does not appear to be attractive. Strawberries, raspberries, blackberries, etc., are visited by most species which are on the wing at their blooming periods.

While imagines of most species of Syrphidæ may be found at some time upon bloom, many genera and species are more commonly found in other habitats. Species of *Microdon* are usually found sunning upon leaves or in long grass in the vicinity of ants' nests. Many species of *Pipizini* prefer sunny leaves to bloom. *Melanostomini* are found most frequently near swamps, streams or moist places. While some species prefer open places, others are found almost entirely in woods. Subswampy woods with plenty of clearings and herbaceous plants appear to be the favorite haunts of the majority of species, at least in the northern half of the United States and Canada. The reason seems to be that in such a location aphids are abundant, rotting wood is everywhere about, sap exudes from wounded trees, and those forms which prefer liquid media find plenty of nourishment. In such woods one also finds the most striking beelike and wasplike forms flitting about or resting upon flowers and foliage, as do the species they imitate. However, the insects which are most abundant in this type of topography are not definitely limited to it and they will be found wherever there is suitable bloom.

Among the plants which I have found best for the collection of specimens of this family are the following: Plum (especially the wild species); wild and cultivated cherries of all kinds; hawthorn (*Cratægus*); basswood or lime (*Tilea*); marsh marigold or cowslip; *Osmorrhiza claytoni;* spiræ; New Jersey tea; Canada thistle; wild aster; goldenrod; and most white bloom, especially of Rosaceæ and Compositæ. Williston reports elder as being good, but it has never repaid me for my visits to it, and I do not believe I have found a dozen species on it, all told, and these common ones. Probably this was because there was so much other more preferable bloom available at the same time. I have found wild black cherry excellent for early-flying species of all descriptions, and have taken many species on it not found, by myself at least, upon any other bloom except choke cherry.

## APPENDIX.

### 108. *Stenosyrphus umbellatarum* Schiner.

(Plate VI.)

This species has been dealt with under *S. albipunctatus*, and is figured on plate VI. Its occurrence in eastern North America is doubtful, and a large series of European specimens is necessary in order to definitely establish its identity, as the species in this group are little understood even in Europe. A specimen from Alaska and one from British Columbia evidently belong here.

### *Stenosyrphus hunteri* n. sp.

Face and cheeks, except a spot below the eyes, reddish yellow; an indication of a narrow median stripe reaching just over the tubercle in the male; antennæ reddish yellow; abdominal bands slightly narrowed laterally; legs and venter entirely reddish yellow.

Length, 10 mm.

*Male*. Eyes bare. Face and cheeks reddish yellow, the latter with a large blackish spot below the eyes; the former with a slender brownish stripe reaching just over the tubercle, visible in some lights. Face, in profile, moderately excavated above, the tubercle large, sub-nose-shaped, the oral margin conspicuous, but less produced than the lowest point of the upper concavity. Facial pile yellow except on the upper angles. Frontal triangle yellow, with a bluish cast above and a black triangle just over the antennæ; thickly yellowish pollinose; pile black and rather long. Vertical triangle black, long and narrow, its pile black; anterior ocellus decidedly remote. Occiput black, obscured by yellowish grey pollen, with short, white pile, which becomes somewhat yellowish above. Occipital ciliæ yellow. Antennæ reddish yellow; third segment subcordate; arista reddish.

Thorax shining greenish black, its disc brassy; pile yellow, paler on the pleuræ. Scutellum subtranslucent yellow, with a bluish opalescence; its pile long, black, yellow across the base.

Legs wholly reddish; coxæ black.

Wings hyaline; stigma yellow; apical cross-vein long, parallel with the wing margin, but a short apex joins the third longitudinal vein at right angles. Squamæ pale yellowish with yellow border and fringe. Halteres yellow.

Abdomen subopaque black, the margin narrowly yellow, except on the apical half of the second segment; with three yellow bands, the first broadly interrupted, situated on the middle of the second segment, the spots formed subtriangular, their inner ends rounded, their outer produced forward along the lateral margin to join the narrow yellow margins of the first segment. Second and third bands narrowly separated from the anterior margin, slightly excavated posteriorly in the middle, only a little narrowed just at the lateral margins. Fifth segment reddish, with a black arch from the posterior angles. Pile yellow, black on the black portions of the second, third and fourth segments and the apex of the fifth. Venter wholly yellow, with pale yellow pile.

Holotype, male; Teulon, Manitoba; May 16, 1922 (A. J. Hunter); in the collection of the author.

This species is distinguished from its allies by the reddish cheeks and oral margin, unicolorous venter, etc. Superficially much like *Syrphus grossulariæ* of which *S. protritus* O. S. is a synonym.

*Syrphus pallifrons* n. sp.

Eyes bare. Abdomen with three yellow bands, the first interrupted and reaching the lateral margins, the last two entire and separated from the margins. Closely related to *abbreviatus* Zett., but the bands usually somewhat undulated and the face with a short median black stripe in the male.

Length, 7 to 8 mm.

*Male.* Face and front yellow; cheeks, oral margin and a median facial stripe extending to the upper end of the tubercle, shining black; pile yellow, black on the upper angles of the face and on the frontal triangle, which is thickly yellowish pollinose laterally and above; not swollen and wholly unicolorous. Vertical triangle long and moderately broad; greenish back, with short black pile. Occiput densely yellowish pollinose above, grey below; with bright yellow pile above, becoming almost white on the cheeks. Antennæ reddish, brown above; third segment short oval; arista brownish, its base more reddish.

Thorax aëneous, with fulvous pile. Scutellum yellow, with yellow pile; often a few black hairs apically.

Legs reddish, the basal fourth of all the femora, sometimes half of the hind ones shining black.

Wings slightly tinged with luteous, sometimes almost hyaline. Stigma luteous. The third longitudinal vein ends well before the tip of the wing. Squamæ pale yellow with yellow border and fringe. Halteres yellow.

Abdomen opaque black; the first and fifth segments, the lateral margins wholly, and the apices of the segments, shining; with three yellow crossbands, that on the second segment near the middle, subtriangular, moderately or broadly interrupted, its anterior corners produced forwards to reach the lateral margins or very narrowly separated from it. Second and third bands entire, almost straight in front, narrowly separated from the anterior margin of the segment, often with a median black abutment, anteriorly; behind convex on each side, moderately or deeply notched in the middle, not reaching the lateral margins; rarely the bands not at all notched medianly. Apex of the fourth segment and the fifth, except an oval basal spot, reddish. Abdominal pile black, longer basally; yellow basally and on the yellow bands except on the median line.

*Female.* Facial stripe brownish, rarely absent; oral margin often only brownish between the tips and cheeks. Front yellow on the lower third, shining black above; wholly short black pilose. Pollen on the occiput often all grey, the pile usually lighter colored.

Thorax more greenish, the sides of the dorsum reddish between the suture and the roots of the wings.

Legs with only the basal fifth or sixth of the femora black, the hind ones usually all red; apical segments of the hind tarsi brownish.

Abdominal bands narrower, usually more undulated, the first always reaching the side margins. Fifth segment with a larger transverse spot.

Holotype, male; Sturgeon Bay, Wis., June 6, 1919 (L. G. Gentner). Allotype, female, Sturgeon Bay, Wis.; June 16, 1919 (L. G. Gentner). Paratypes: Male, Agornis, New Brunswick, July 11, 1913 (A. B. Baird); male, North Sargus, Mass., August 13, 1911 (J. D. Tothill); female, Melrose Highlands, Mass., June 18, 1911 (J. D. Tothill); male, Sturgeon Bay, Wis., June 6, 1919 (L. G.

Gentner); female, Ottawa, Canada, July, 1914; female, Madison, Wis., May 10, 1917 (C. L. Fluke); female, Madison, Wis., May 3, 1917 (C. L. Fluke).

This species is very like *S. abbreviatus* Zett., but differs in that the abdominal bands, except the first, do not reach the lateral margins, the pile of the front of the female is much shorter, and the front is slightly different in color. It seems probable that *S. abbreviatus* is a synonym of *S. latifasciatus*, and Verrall has considered it as such.

### *Syrphus snowi* new name.

*Syrphus ruficauda* Snow, Kans. Univ. Quart., i, 36, 1892.

I propose the name *snowi* for this species, as the name *ruficauda* is preoccupied by Bigot (Annales, Ent. Soc. Fr., 1883), for a species from New Caledonia.

### *Syrphus palliventris* n. sp.

Eyes bare. Face without a median black stripe; oral margin not black; abdomen with three pairs of yellowish red spots, all attaining the lateral margins, the last two arcuate; fifth and sixth segments wholly yellowish red.

Length, 10 mm.

*Female.* Face and lower two-thirds of the front shining reddish yellow; jowls, narrow anterior oral tip, and upper third of the front, shining blackish. Face scarcely concave above, the tubercle large, salient, the anterior oral margin about on a plane with the tip of the antennal prominence. Face with yellow, the front with black pile. Occiput densely yellowish pollinose above, greyish below, with fulvous pile above and yellowish below. Antennæ reddish, brownish above; third segment elongate oval, not quite twice as long as wide, its apex obtusely rounded, more cut-off below. Arista reddish, its apex brown.

Thorax metallic watery bluish greenish, the mesopleuræ somewhat bronzed; sides of the metanotum brassy yellowish; pile tawny, pale yellow on the pleuræ. Scutellum transluscent yellow, with black pile except on the basal angles.

Legs reddish; apical tarsal segments becoming somewhat brownish.

Wings hyaline; stigma luteous. Third longitudinal vein moderately curved a little beyond the middle of the first posterior cell, which is obtuse apically. Squamæ obscurely yellow, with yellow border and fringe. Halteres yellow, their stems luteous.

Abdomen shining black, the second to fourth segments opaque on the disc on the anterior three-fourths; with three pairs of reddish yellow spots, the last two arcuate and all reaching the side margins. Spots on the second segment near the middle, elongate, transverse, over twice as long as wide, their inner ends rounded, produced forward from the outer end to reach the side margins, along which they continue narrowly to the base of the segment; second and third pairs of spots concave in front, almost straight behind, their inner ends subtruncate, their outer reaching the side margins by a broad anterior production which is continued forward narrowly and obscurely along the sides to the anterior angles. Apex of the fourth and the following segments wholly, shining reddish yellow. Venter wholly yellow. Pile of the dorsum short, black,

including that on the side margins, except basally, on the base and yellow spots, yellowish; all yellow on the venter.

Holotype, female; Nordegg, Alberta; June 27, 1921 (J. McDunnough); in the Canadian national collection, Ottawa.

This species is related to *snowi* but is distinguished from that species and its other allies by the entirely yellow venter, yellow oral margin, black-haired scutellum, red abdominal tip and the fact that the spots reach the side margins.

### *Syrphus montanus* n. sp.

(Plate VIII, fig. 110; Plate XI, fig. 110.)

Eyes bare. Allied to *perplexus* and *neoperplexus*. Oral margin broadly black, emitting a facial stripe as far as the tip of the tubercle; frontal triangle entirely whitish yellow, not swollen; abdominal spots very broad.

Length, 9.5 mm.

*Male*. Face and frontal triangle pale whitish yellow, with a slight bluish opalescence; the latter narrowly yellow pollinose along the orbits. Face in profile, moderately concave above the noselike tubercle, between which and the small oral tip it recedes strongly and is concave. Cheeks, oral margin broadly and a narrow median stripe reaching just to the tip of the tubercle, shining blackish. Facial pile fine, yellow; black on the frontal triangle and vertical triangle. Vertical triangle black, a little longer than the contiguous portion of the eyes, not as wide as long. Occiput silvery greyish pollinose, with short, white pile; cheeks white pilose. Antennæ reddish, brownish above; third segment short, rectangularly oval. Arista reddish brown.

Thorax shining bluish, the dorsum aëneous bluish, the disc more bronzed; pile yellowish, whitish on the pleuræ. Scutellum transluscent yellowish, its base and sides black; pile whitish yellow.

Legs reddish; basal half of the anterior four and four-fifths of the hind femora, black; hind tarsi also black on the apical one or two segments.

Wings hyaline; stigma yellow. Squamæ pallidly yellowish with yellow border and fringe. Halteres yellow.

Abdomen opaque black, first segment wholly and the sides and apices of the remaining segments, shining; with three pairs of isolated yellow spots. Spots on the second segment large, subtriangular, widely separated from each other, almost as wide as long, their inner ends sharply rounded, the outer parallel to the lateral margins; situated slightly behind the middle of the segment. Second and third pairs arcuate, rather sharply concave in front, convex behind, their inner ends closer to the front margin of the segment, their width over half the length of the segment; moderately separated from each other medianly, narrowly so from the lateral margins. Apices of the third and fourth, the latter more broadly, and the fifth segment, except an elongate, transverse, median spot, reddish. Pile mostly rather long, black; on the base and yellow markings, yellowish. Venter reddish; each segment with a broad, abbreviated transverse blackish band, the first segment black except apically; pile all yellow.

Holotype, male; Beaver Creek, Montana; 6,300 feet; August, 1913 (S. J. Hunter); in the University of Kansas museum.

Readily distinguished from *lapponicus* by the only gently curved third longitudinal vein; differs from *perplexus* in the wider, more widely separated abdominal spots; from *neoperplexus* by the presence of a facial stripe, less

salient tubercle and wider abdominal bands; from *snowi* by the presence of a facial stripe, less extensively reddish abdomen, etc. It is more slender than any of these species.

## *Syrphus lapponicus* Zetterstedt.

Lundbeck has shown in his "Diptera Danica" that our species cannot be *Syrphus arcuatus* Fallen, as in that species the first band or pair of spots extend narrowly over the side margin. He suggests that our species may be different from *lapponicus*, but I can find no difference between at least some of our forms and European specimens. Our species with the deeply looped or strongly curved third longitudinal vein, which has long been considered *S. arcuatus*, should therefore be known as *S. lapponicus* Zetterstedt.

## *Syrphus laticaudus* n. sp.

(Plate XI, fig. 151.)

Abdomen broad, with three pairs of reddish or yellowish spots, the last two pairs oblique and arcuate, the first and second pairs reaching or not quite reaching the lateral margins, or the second pair also well separated from it. Resembles *Syrphus pacificus* Lovett, but is shorter and broader than most specimens of that species and the pile of the front is shorter, the first posterior cell less acute; female with almost all reddish legs. In *pacificus* the femora are black basally.

Length, 6.5 to 7 mm.

*Male.* Face translucent luteous yellow (in fresh specimens somewhat greenish) with a bluish opalescence; cheeks, a broad median stripe, broadening above the tubercle, but ending distinctly below the antennæ, and the frontal triangle, shining black, the latter more or less bronzed. In profile the face is a little swollen above, almost perpendicular, the tubercle rather long and about on a plane with the antennal prominence; somewhat receding below the tubercle to the oral margin; pile black, rather abundant, longer on the frontal triangle; the W above the base of the antennæ may be somewhat brownish, but is never reddish. Vertical triangle rather dull bluish black, with black pile. Occiput black; greyish pollinose along the eyes; pile black above, rich yellow below, black on most of the cheeks, but not on the posterior part. Antennæ reddish yellow, the third segment brown apically and above; arista luteous.

Thorax shining bluish black, with moderately abundant yellowish pile. Scutellum translucent brownish yellowish, with a strong bluish opalescence which conceals the color in some lights; base and sides metallic blue. Pile long, rather sparse, usually chiefly black, but sometimes only the apical third with black pile.

Legs reddish yellow; basal fourth of the anterior four and three-fourths of the posterior femora, and the hind tarsi, black; hind tibiæ obscurely brownish on the apical half; sometimes the hind tarsi black only on the apical three segments. Pile sparse, not conspicuous, mostly yellowish, black behind the anterior femora.

Wings lightly brownish; stigma luteous. First posterior cell not quite as acute as in *pacificus*, but the apical crossvein not joining the third vein at quite such a right angle. Squamæ pallidly yellow, with yellow border and fringe. Halteres yellow.

Abdomen shining black, the second segment almost opaque, the third subopaque in front; with three pairs of yellow spots, all placed a little obliquely, the second and third pairs arcuate. First pair of spots twice as long as wide, their inner ends rounded or sharply rounded, the outer obliquely truncate so that their anterior angles may be produced forwards to touch the lateral margins about the middle of the segment, their inner ends closer to the anterior margin. Second and third pairs of spots narrowly separated, their inner ends a little enlarged, concave in front, slightly convex behind; their outer ends near the middle of the segment, their inner moderately separated from the anterior margin; inner ends rounded. Apices of the fourth and fifth segments yellow. Pile black in the type, in one specimen yellow before the middle of the second segment. Ventral segments each with a broad, shining black crossband, elsewhere greenish yellow, with long, sparse, black pile.

*Female.* Face clear yellow, with short black or yellow pile, the median stripe sometimes a little narrower. Front broad, moderately narrowed above; shining black, across the middle moderately broadly yellowish grey pollinose; wholly short black pilose. Occiput wholly yellowish or whitish pilose.

Thorax with short pile. Scutellum more yellow, the base and sides shining black.

Legs all dull reddish yellow, the subapical two tarsal segments, or the apical three, blackish or brownish.

Wings almost hyaline, the first posterior cell more obtuse. Squamæ white, with white border and fringe. Halteres yellow.

Abdomen wholly shining, the spots narrower, the first pair always reaching the lateral margin, more or less broadly, the second pair usually produced forward laterally to the lateral margin, but not always touching it; the third pair never reaching the margins. Apices of the fourth and fifth segments yellow, the latter with a pair of reddish or orange oval spots within the anterior angles. Sixth segment very narrowly reddish apically.

Holotype, male, Orillia, Ontario, May 5, 1921; allotype, female, Orillia, May 2, 1921; Paratypes, 3 males, 3 females, Orillia, May, 1921; all collected by the author. Types in the Canadian national collection, Ottawa, Canada.

This species is most closely allied to *pacificus* Lovett, but in that species the spots never reach the side margins, or do so indistinctly, but may do so in the female. The femora of the male are a little less extensively black and not at all black in the female of *laticaudus*. It differs from *pauxillus* in the bands going over the margins, shorter pile, yellow femora in female, less acute first posterior cell and in having black pile on the front. (In *pauxillus* the pile is rather yellowish, except just above the antennæ, in the female; I do not know the male, but it is evidently a broader species and the antennæ should be practically all black.)

## *Syrphus laticaudatus* n. sp.

(Plate XI, fig. 152.)

Eyes pilose. Allied to *intrudens*, but differing from all the described species in its broad abdomen and the peculiarly shaped reddish abdominal spots.

Length, 12 mm.

*Male.* Face whitish sulphur yellow; cheeks, oral margin broadly, and a broad median stripe ending decidedly below the antennæ, shining black;

in profile a little swollen below the antennæ, thence perpendicular to the oral tip; the tubercle small, more prominent than the antennal base; pile sparse, rather long, black. Front broad, considerably narrowed above, shining black, with a bronzed or brassy reflection; across the middle with a broad, greyish yellow, narrowly interrupted pollinose band; no reddish W above the antennæ; pile moderately long, black. Occiput greyish yellow pollinose, with yellowish pile; pile on the cheeks and the occipital ciliæ, black. Antennæ black, brownish below; third segment slightly longer than broad; arista black.

Thorax aëneous, with fulvous pile. Scutellum translucent brownish yellowish, the base and corners aëneous, the whole with an aëneous reflection; pile black, some tawny hairs intermixed.

Legs reddish; basal half of the anterior four and three-fourths of the hind femora, black; hind tibiæ with an obscure darker band beyond the middle.

Wings slightly luteous, more marked anteriorly; stigma brownish luteous; the third longitudinal vein ends slightly before the tip of the wing. Squamæ whitish, with yellowish border and fringe. Halteres yellow.

Abdomen shining black, the disc of the second segment less shining, first segment aëneous; with three pairs of reddish yellow spots. First pair of spots about the middle of the second segment, transverse, slightly concave in front, slightly convex behind, their inner ends obtusely rounded, the outer subtruncate, a little longer anteriorly. Second pair of spots transverse, occupying the anterior half of the third segment, triangularly excavated anteriorly, the outer arm of the concavity longer, slightly concave posteriorly, the inner ends rounded behind, the outer triangularly cut off so that they go over the margins in two-thirds their greatest width; they do not quite touch the anterior margin of the segment; third pair of spots similar, but closer to the anterior margin laterally, touching it in the middle. The incomplete reddish apex of the fourth segment forms a complete yellow band with the anterior angles of the fifth. Apices of the fifth and sixth segments reddish. Pile black; fulvous on the yellow spots and bands, including the side margins. Only the first pair of spots are separated from the lateral margins. Venter reddish; each segment with a broad, black, posterior crossband, extending to the sides; first segment black basally.

Holotype, female; Victoria, British Columbia; May 10, 1916 (R. C. Treherne).

This species differs from all others so far described in its broader abdomen, shape of the bands, larger size, facial profile and broader, somewhat shorter front.

### *Syrphus osburni* n. sp.

(Plate XI, fig. 153.)

Eyes pilose. Face with a broad median black stripe; scutellum yellow pilose; abdomen with three pairs of reddish yellow spots, the last two arcuate, all reaching the side margins in their full width.

Length, 8 mm.

*Male.* Face translucent yellowish, with a bluish opalescence; cheeks before the jowls, oral border narrowly and a broad facial stripe, not quite reaching the antennæ, shining black; jowls metallic bluish, lightly dusted with greyish pollen. Face, in profile, with a small swelling just below the antennæ, thence

almost perpendicular, deeply and sharply excavated between the tubercle and anterior oral margin; pile sparse, fine, whitish. Frontal triangle metallic bluish, lightly dusted with greyish pollen; pile black, more cinereous above. Vertical triangle long, metallic bluish, with black pile, which becomes whitish posteriorly. Occiput black, along the orbits densely greyish pollinose, with whitish pile; cheeks with whitish pile. Antennæ yellowish, third segment brownish above, oblong oval; arista luteous.

Thorax metallic blackish green, with pallidly yellow pile. Scutellum translucent yellowish brown, with strong metallic blue reflection; base and sides metallic blue; pile all long, pale, yellowish.

Legs reddish yellow, the basal half of the anterior four and four-fifths of the hind femora, blackish; hind tarsi fuscous apically.

Wings hyaline; stigma luteous. Squamæ almost white, with pale yellow border and fringe. Halteres pale yellow.

Abdomen shining brownish black, the second segment largely subopaque; with three pairs of yellow spots. First pair of spots situated about the middle of the second segment, elongate oval, broadly separated from each other, and moderately so from the lateral margins, but there is an obscure streak stretching forward laterally toward the margin; the spots transverse. Second and third pairs of spots arcuate, moderately separated from each other, concave in front, slightly convex behind, their inner ends somewhat clubbed and nearer the anterior margin than the outer end; posteriorly they are somewhat narrowed laterally by a black triangle. Apices of the fourth and fifth segments yellow; fifth with the narrow lateral margin and a small triangular spot on each anterior angle, reddish. Pile long, yellow, shorter on the disc; black on the black portions beyond the middle of the second segment. Venter yellow; first segment, except apically, and moderately broad fasciæ on each of the following segments, shining black; the first fascia emits a narrow median stripe to the front margin of the second segment; pile yellow.

Holotype, male; Orillia, Ontario; May 8, 1921 (C. H. Curran); in the author's collection.

Superficially this species resembles *laticaudus*, but may be distinguished at once by the broader spots which reach the side margins, and from *S. flukei* by its pilose eyes. It gives me great pleasure to name this species in honor of Dr. Raymond C. Osburn.

### *Syrphus limatus* Hine.

(Plate XI, fig. 154.)

Eyes pilose; face with a broad, median black stripe; abdomen with three pairs of reddish spots, the first pair well separated from the lateral margin and from each other, the last two very narrow, attaining the lateral margins, slightly oblique, their sides parallel, their inner ends narrowly separated.

Length, 11 mm.

*Female*. Face yellow; cheeks, oral margin narrowly and a median stripe one-third the width of the face, not reaching the base of the antennæ, shining black; in profile moderately excavated between the antennal base and the prominent, elongate tubercle, below which it is shortly and shallowly excavated to the anterior oral tip, which is decidedly less prominent than the middle of the face. Pile fuscous. Front moderately broad, moderately narrowed

above, black pilose; across the middle with a broadly interrupted greyish pollinose band. Occiput densely yellowish grey pollinose, with greyish white pile. Antennæ black; third segment about twice as long as wide, its end rounded; arista brown, moderately slender.

Thorax metallic black, the sides of the dorsum before the suture, brassy; pile whitish yellow. Scutellum translucent luteous yellowish, its base and corners black; pile whitish.

Anterior four femora on the basal third or more, hind ones except the apex, hind tibiæ except the base, and all the tarsi, blackish, the basal tarsal segments somewhat paler; legs elsewhere reddish, the tibiæ with a darker preapical band.

Wings hyaline; stigma brown; subcostal cell yellowish. Squamæ white, with whitish fringe. Halteres reddish.

Abdomen shining black, the second segment opaque on the disc; with three pairs of narrow, reddish transverse spots. Spots on the second segment elongate oval, twice as long as wide, situated near the middle of the segment, broadly separated from each other and from the lateral margins. Second pair of spots a little oblique, their outer end moderately separated from the lateral margin, the black gradually decreasing so that on the median half they wholly touch the margin, their inner ends narrowly separated, rounded, sides parallel; at the very lateral margin the spots broaden out somewhat anteriorly; spots on the fourth segment similar, more narrowly separated and narrower medianly. Very narrow apices of the fourth and fifth segments and subtriangular spots reaching the margin on the anterior angles of the latter, reddish. Pile pale yellowish; short, black beyond the middle of the second segment except on the yellow bands.

A single female; Creede, Colo., August, 1914 (S. J. Hunter); in Kansas University museum.

This species is very distinct from *intrudens* and allies by the very narrow, parallel-sided, slightly oblique bands. The pile is paler than usual. The legs are pale pilose; in *pauxilus* they are black, at least behind the femora.

## *Syrphus amalopis* Osten Sacken.

I have not been able to recognize this species definitely. In my collection I have three specimens which differ from *intrudens* in that the second ventral segment has no black crossband and the dorsal abdominal spots are a little different in shape, but not sufficiently to attract particular attention, as there is very great variation in *intrudens*. The wholly yellow second ventral segment appears to be the one definite character by which the two species can be readily distinguished.

On the other hand, Osten Sacken's description of *amalopis* fits European specimens of *S. venustus* Meigen almost perfectly, and I have long suspected that they were the same species. My North American specimens of *venustus* differ somewhat from the European, but appear to be conspecific. An examination of Osten Sacken's types will be necessary to decide the identity of the species. Various forms of *intrudens* have been included under *amalopis* in collections. (The impression left by an examination of the types is that they represent a single species.)

### *Syrphus disgregus* Snow.

I am unable to decide definitely whether this species is distinct from *intrudens*. The only difference in the two species lies in the difference in the shape of the first pair of abdominal spots, which are broadly oval in *disgregus* and elongate oval in *intrudens*. I have not found, in about one hundred specimens of *intrudens* from California to Alaska and the Northern States and Canada, any specimens which quite approach this species, although some come rather close. I suspect, however, that *disgregus* is only a variety, but a good series of specimens from New Mexico will be required to decide the question.

### *Syrphus lotus* var. *creper* Snow.

Snow's description of *S. creper* is rather misleading, as an examination of the types shows. I have before me thirteen specimens of *S. creper* and *lotus* and the only difference between the two species is in the amount of interruption of the second and third abdominal bands, and the whole series of Snow's types, according to his description, contained typical *lotus* as well as his *creper*. There is no actual difference in the amount of the obliqueness of the bands, as indicated by Snow, the apparent difference being due to the shape assumed by the abdomen in drying. My figure of *S. lotus*, Plate VI, fig. 51, would serve just as well for *creper* if the bands were narrowly interrupted. There is some variation in the width of the bands and also in the shape of the black before their outer ends, but this is not sufficient to be considered specific. *S. creper* should not be ranked as more than a variety of *S. lotus*, and merely represents an extreme in coloration, hence is not even a firmly established variety. Possibly the specimen described by Williston as *S. lotus* is a different species, as it lacked a black stripe on the cheeks. In all the specimens I have seen, including those determined by Snow as *lotus*, the stripe is present. Williston's specimen may have been teneral, as he states that the facial stripe is brown, but in actual practice the difference between black and brown is so slight that it cannot be considered of value where ground color is considered, as all teneral forms which are normally black when fully pigmented, appear brown.

### *Syrphus rufipunctatus* n. sp.

(Plate XI, Fig. 155.)

Thorax and abdomen metallic steel blue, the latter with three pairs of narrow reddish spots, all broadly separated from the lateral margins, the last two pairs somewhat oblique; face and lower sixth of the front, reddish yellow, the former with the cheeks, oral margin and a stripe in the middle as high as the tubercle, shining black.

Length, 10 mm.

*Female*. Face reddish yellow; cheeks, oral margin broadly and a median stripe not extending completely over the tubercle, shining black; in profile almost plane between the tubercle and oral margin, the tubercle rather large and prominent, slightly excavated above; pile whitish. Front shining black, slightly steel blue, the lower sixth concolorous with the face; pile rather abundant, black; no pollinose crossband. Occiput steel blue, moderately greyish pol-

linose; pile whitish, with a slight yellowish tinge, including the occipital ciliæ. Antennæ black, third segment obtusely oval; arista brown. Eyes bare.

Thorax metallic steel blue; pile yellowish. Scutellum translucent luteous, its base and sides steel blue; pile pale yellowish.

Femora black, the apical fourth, less of the hind ones, reddish yellow. Anterior four tibiæ reddish yellow; all the tarsi and the median half of the hind tibiæ, brownish, the ends of the hind tibiæ reddish.

Wings hyaline, yellow basally; stigma luteous. Squamæ white. Halteres yellow, the stem brown.

Abdomen shining steel blue. Spots on the second segment transverse, near the middle, broadly separated from the lateral margin, over twice as long as wide, their inner ends narrowed and sharply rounded, the outer obtusely rounded. Spots on the third segment narrow, a little oblique, their inner ends larger, rounded, the outer rounded, slightly concave in front laterally, more broadly separated from each other than from the lateral margins, broadly so from them. Third pair similar, but a little narrower. Medianly the spots are separated from the anterior margin of the segment by not quite their width, by more than this distance laterally. Narrow, incomplete apices of the fourth and fifth segments reddish. Pile conspicuous, black; whitish basally, forming complete bands across the reddish spots and almost so across the basal half of the fifth segment. Venter black, the incisures orange.

Holotype, female; Lillooet, British Columbia; July 24, 1917; in the collection of Doctor Melander.

This species is quite distinct from any I have seen and no description available applies to it. Superficially it appears as though it might be melanic, but an examination indicates that this is not the case. It is related to the *lapponicus* group, but differs from these in the black oral margin, short facial stripe, color of the front, shorter antennæ, shape of abdominal spots, color of venter, etc.

### *Brachyopa punctipennis* n. sp.

Ferruginous reddish; males without a median longitudinal darker stripe on the abdomen, but with narrow, obscure brownish hind segmental margins in both sexes; arista of female markedly long plumose. Very similar to *B. notata*, but with more slender hind femora, etc.

Length, 6 mm.; wing, 6.5 mm.

*Male*. Face and front ferruginous reddish yellow; face covered with fine white tomentum except on the cheeks, oral border and anterior oral tubercle; frontal triangle with the narrow orbital margins similarly covered. Face rather deeply and broadly concave, the oral margin slightly more prominent than the antennal base; produced moderately downwards; without pile except on the cheeks. Frontal prominence above with seven or eight parallel longitudinal shallow striæ. Vertical triangle ferruginous reddish, with extremely short fulvous or brownish pile; greyish pollinose before the ocelli; long and narrow. Occiput brownish, moderately greyish white pollinose, with short fulvous or brownish pile above, longer, whitish pile below. Antennæ orange; third segment elongate, obtusely oval; arista brown, shortly plumose.

Thorax ferruginous yellowish, the dorsum thickly whitish pollinose, with two moderately broad, narrowly separated median stripes and a broader one

on either side, contiguous with the broad lateral margins anteriorly, shining. Pile short, whitish on the pleuræ, yellowish on the disc, apparently more or less brownish. Scutellum long, concolorous with the dorsum; apically with six or eight long, stouter hairs, the apical two broadly separated. Usually a stout hair before and behind the outer end of the suture and several above the roots of the wings, but these not conspicuous.

Legs luteous reddish, the tarsi darker, becoming blackish apically.

Wings cinereous hyaline, yellowish on the anterior half; with a fuscous cloud apically between the apices of the second and third longitudinal veins, darker along the costa; a conspicuous fuscous spot at the end of the spurious vein and a smaller one on the anterior cross-vein and sometimes one on the veins closing the second basal cell.

Abdomen ferruginous yellowish, the apices of the segments narrowly obscure brownish. Pile very short, inconspicuous, yellowish. Venter reddish yellow.

*Female.* Face shining, except a narrow transverse band below the antennæ. Front opaque except on the antennal prominence and on the ocellar triangle, which may be brownish; sometimes a narrow shining stripe extends forward from the ocellar triangle. The frontal pile appears blackish or brownish, but is apparently largely reddish yellow or fulvous, especially anteriorly. Arista densely short black plumose, very conspicuously so.

Legs pale luteous yellow, the apical two tarsal segments brown or black.

Wings much clearer, the apical cloud more confined along the veins, the spot at the end of the spurious vein paler in color and much longer.

Apical segmental bands of the abdomen very narrow, ferruginous.

Holotype, male, Hood River, Ore., May 24, 1917 (F. R. Cole); allotype, female, Lake Crescent, Piedmont, Washington, July 26, 1917 (A. L. Melander). Paratypes: Male, Hood River, Ore., June 7, 1917 (F. R. Cole); female, Vancouver, British Columbia.

This species is based on the specimens referred to in my revision of this genus as western specimens of *B. notata*, and at that time I called attention to apparent differences. The absence of the median abdominal stripe in the male and the almost absent apical segmental bands in the female are distinctive characters; the arista is more densely and longer plumose, the genitalia of the male slightly larger; the general color darker.

### *Sericomyia calcarata* n. sp.

Face with a median black stripe; abdomen with three pairs of whitish yellow spots, the last two pairs broadest laterally; hind femora black, with some yellow pile above; hind coxæ with a spur as in *militaris*.

Length, 15 to 17 mm.

*Male.* Face yellow; cheeks, a broad, complete median stripe and the frontal triangle, shining black; face in profile almost perpendicular to the small, rounded tubercle, below which it is less prominent, but still perpendicular; subconical, moderately produced downwards; pile yellow; yellow portion of the face silvery yellow pollinose when viewed from above; sides of the frontal triangle with similar pollen and black pile. Vertical triangle scarcely shining, with black pile except at the vertex. Occiput greyish yellow pollinose, with yellow pile. Antennæ black; third segment subrectangular, a little longer below; arista brown, long plumose.

Thorax slightly shining black, with yellow pile; a broad band of black pile between the roots of the wings. Scutellum translucent reddish, with black pile except on the base.

Femora black, the apical third of the anterior four, rarely the ends of the hind ones and all the tibiæ, reddish; tarsi similar in color, the last two segments black. Pile yellow or fulvous, black behind the anterior four femora and chiefly black on the hind ones.

Wings yellowish or luteous anteriorly on the basal three-fifths, blackish apically in front, cinereous hyaline elsewhere (similar to *militaris*). Squamæ whitish basally, becoming yellow, with brownish border and brown fringe. Halteres brown.

Abdomen opaque black, first segment and side margins shining black; apex of the fourth and almost all the fifth segment, aëneous; with three pairs of slightly oblique whitish yellow or yellow spots. First pair of spots situated about the middle of the second segment, decidedly oblique, their inner ends well before the middle of the segment, usually larger, the outer end often ending in a point near the margin, but frequently of nearly equal width. Second and third pairs of spots narrowly separated medianly, nearer the anterior margin of their respective segments, slightly oblique, very gently concave in front, almost straight behind, broadest laterally, their inner ends rounded, their outer truncate, not reaching the margin. Pile almost all bright yellow, rarely almost whitish, silky towards the apex, forming a conspicuous apical band on the fourth segment; a transverse subapical black pilose band on the second segment.

Holotype, male, Lake McDonald, Glacier Park, Montana, August 14, 1916 (A. L. Melander); paratypes, four males, Moscow Mountain, Idaho. Types in the collection of Doctor Melander and the author.

This species is closely related to *S. militaris* Walker. It differs from that species in the shape of the abdominal bands, facial profile, color of the pile on the femora (the femoral pile is all black on the hind legs of all my specimens of *militaris*). It appears to be related to *S. borealis*, but the abdominal bands are narrower and the coxal spur is small in that species. All the other species known to me lack the spur.

## *Volucella violacea* Say.

(Plate X, Fig. 143.)

This species has long been considered a synonym or only a color variety of *V. esuriens* Fabr., and has been represented in collections under the name *V. mexicana* Macquart. The two species are quite distinct, as an examination of the figures of the genitalia (Plate X, figs. 143 and 144) will at once indicate. There is no intergradation, in so far as the specimens of both species before me will permit of determination. Those specimens with a violet reflection all possess genitalia as in figure 143, and it is safe to say that the females possessing this reflection are of the same species. Teneral forms of *esuriens* are always more brownish, rather than violet. I have over a hundred specimens of *esuriens* and forty of *violacea* before me.

## BIBLIOGRAPHY.

ADAMS, C. F. Notes and Descriptions of North American Diptera; Kans. Univ. Sci. Bull., ii, 433; 1904.

ALDRICH, J. M. Catalogue of North American Diptera; Smith. Misc. Coll. No. 1444; 1905.

BANKS, GREENE, MCATEE and SHANNON. District of Columbia Syrphidæ; Proc. Biol. Soc. Wash., xxix, 173-203; 1916.

BEZZI, M. Syrphidæ of the Ethiopian Region; Brit. Mus. Nat. Hist. 1915.

——— Syrphidæ Æthiopicæ; Mus. Nat. Hung.; 1920-'21.

BIGOT, J. Annales, Ent. Soc. de Fr., 1883, pages 61-88, 221-258, 315-356.

——— Do, 1884, pages 535-560, 73-115.

COLE, F. R., and LOVETT, A. L. New Oregon Diptera; Proc. Cal. Acad. Sci., (4), ix, 221; 1919.

——— List of the Diptera of Oregon (Two New Syrphidæ); Proc. Cal. Acad. Sci., (4), ix, 197; 1921.

COQUILLETT, D. W. Diptera of the Harriman Alaska Expedition; Proc. Wash. Acad. Sci., xi, 389; 1900.

——— New Cyclorrhaphous Diptera from Mexico and New Mexico; Can. Ent., xxxiv, 195; 1902.

——— Notes on the Syrphid Fly, *Pipiza radicum*, Walsh and Riley; Proc. Ent. Soc. Wash., vi, 200; 1904.

——— New Genera and Species of Diptera; Can. Ent., xxxix, 75; 1907.

——— New Genera and Species of North American Diptera; Proc. Ent. Soc. Wash., xii, 124; 1910.

CURRAN, C. H. Syrphidæ Collected in England and France; Can. Ent., lii, 35; 1920.

——— Observations on the More Common Aphidophagous Syrphid Flies; Can. Ent. lii, 53; 1920.

——— Revision of the Syrphus Species Belonging to the *Ribesii* Group; Can. Ent., liii, 152; 1921.

——— New Species of Syrphidæ; Can. Ent., liii, 171; 1921.

——— A New Western Syrphid; Can. Ent., liii, 258; 1921.

——— A Genus and Species of Syrphidæ New to Canada; Can. Ent., liii, 260; 1921.

——— New Species of Canadian Syrphidæ; Can. Ent., liii, 275; liv, 14; 1921-1922.

——— New Species of the Syrphid, Genus *Chilosia*, from Canada; Can. Ent., liv, 67; 1922.

——— New and Little Known Canadian Syrphidæ; Can. Ent., liv, 94, 114; 1922.

——— Revision of the *Pipiza* Group of the Family Syrphidæ from North of Mexico; Proc. Cal. Acad. Sci., (4), xi, 345; 1921.

——— The Genera *Hammerschmidtia* and *Brachyopa* in Canada; Ann. Ent. Soc. Am., xv; Sept., 1922.

DAVIDSON, W. M. Notes on Certain Species of *Melanostoma;* Trans. Am. Ent. Soc.; xlviii, 35-47; 1922.

FLUKE, C. L. Syrphidæ of Wisconsin; Trans. Wis. Acad. Sci., etc., xx, 215; 1922.

FORBES, S. A. Corn-feeding Syrphus Fly; Rept. Entom. Ill., xxiii, 162.

GRAENICHER, S. Syrphidæ of Milwaukee County; Bull. Wis. Nat. Hist. Soc.; July, 1900; 167.

——— A Preliminary List of the Flies of Wisconsin Belonging to the Families Bombyliidæ, Syrphidæ and Conopidæ; Bull. Wis. Nat. Hist. Soc., viii, 32; 1910.

——— Some Rare Diptera; Can. Ent., xlii, 28; 1910.

HINE, JAMES S. The Genus *Myiolepta;* Ohio Naturalist, xiv, 205; 1913.

——— Diptera of Middle America; Ohio Naturalist, xiv, 333; 1914.

——— Descriptions of Alaskan Diptera of the Family Syrphidæ; Ohio Journ. Sci., xxii, 143; 1922.

HUNTER, W. D. A. Contribution to the Knowledge of North American Syrphidæ, i; Can. Ent., xxviii, 87; 1896.

——— A Summary of the Genus *Chilosia* Meigen in North America, with Descriptions of New Species; Can. Ent., xxviii, 227; 1896.

——— A Contribution to the Knowledge of North American Syrphidæ, ii; Can. Ent., xxix, 121; 1897.

JOHNSON, C. W. Some North American Syrphidæ; Psyche, xiv, 75; 1907.

——— Some Additions to the Dipteran Fauna of New England; Psyche, xvii, 229; 1910.

——— Some New England Syrphidæ; Psyche, xxiii, 75; 1916.

——— The *Volucella bombylans* Group in America; Psyche, xxiii, 159; 1916.

——— On the *Criorhina intersistens* Walker and an Allied New Species; Ent. News, xxiv, 293; 1916.

——— A New Species of *Criorhina* from New England; Psyche, xxiv, 153; 1917.

——— Species of the Genus *Brachyopa* of the Eastern United States; Can. Ent., xlix, 360; 1917.

——— North American Diptera Described by Nils S. Swederus; Can. Ent., li, 32; 1919.

——— New Diptera from Texas and Mexico; Psyche, xxviii, 56; 1921.

JONES, C. R. New Species of Colorado Syrphidæ; Ann. Ent. Soc. Am., x, 219; 1917.

——— Contribution to Our Knowledge of Syrphidæ of Colorado; Bull. 209, Colo. Agric. Exp. Sta; 1922.

JONES, P. R. Notes on Some Little-known North American Syrphidæ; Ent. News, xviii 238; 1907.

——— Preliminary List of Nebraska Syrphidæ, with Description of New Species; Jour. N. Y. Ent. Soc., xv, 87; 1907.

KAHL, P. H. I. New Species of the Syrphid Genera *Mixogaster* and *Ceria;* Kans. Univ. Quart, vi, 137; 1897.

KNAB, FREDERICK. Some North American Species of *Microdon;* Proc. Biol. Soc. Wash., xxx, 133; 1917.

——— Critical Notes on Syrphidæ; Insec. Inscit. Mens., iv, 91; 1916.

——— Further Notes on Syrphidæ; *l. c.*

LOVETT, A. L.—See COLE and LOVETT.

LUNDBECK, WILLIAM. Diptera Danica, Part V; 1916.

MACQUART, M. Hist. Nat. Dipt.; 1834.

MALLOCH, J. R. Rept. Can. Arct. Expd. (Dipt.), page 53*c*.

MATSUMURA, S. Synopsis of the Economic Syrphidæ of Japan; Ent. Mag. (Japan); published in three parts, in vols. ii and iii.

METCALF, C. L. Syrphidæ of Ohio; Ohio Biol. Survey, i; No. 1; 1916.

——— Syrphidæ of Maine; Me. Agr. Exp Sta. Bull. 253; 1916.

——— Syrphidæ of Maine; Me. Agr. Exp. Sta. Bull. 263; 1917.

——— Proposed Nomenclature for the Parts of the Posterior Respiratory Apparatus of Dipterous Larvæ, etc.; Psyche, xxvi, 53; 1919.

——— The Genitalia of Male Syrphidæ; Ann. Ent. Soc. Am., xiv, 169; 1921.

MICHL, EDUARD. Beitrag zur Kenntnis des Genus *Chilosia* Meigen; Verh. Zoöl.-Bot., Gesell. Wien., lxi, 287; 1911. (*Chilosia similis* n. sp. This is

a true *Chilosia,* and the placing of *C. similis* Shannon, 1916, in *Cartosyrphus* makes change of name unnecessary.)

MILLER, DAVID. Material for a Monograph of the Diptera of New Zealand (Syrphidæ); Trans. N. Z. Institute, liii, 289; 1921.

MOODIE, R. L. A new *Milesia* from Arizona, with Notes on Some Wyoming Syrphidæ; Ent. News, xvi, 138; 1905.

OSBURN, R. C. Studies on Syrphidæ: I, *Syrphus arcuatus* Fall. and a Related New Species; Jour. N. Y. Ent. Soc., xviii, 55; 1910.

——— Studies on Syrphidæ: IV, Species of *Eristalis* New to America, with Notes on Others; Jour. N. Y. Ent. Soc. xxiii, 139; 1915.

——— Studies on Syrphidæ: II, The Invalidity of *Scaeva* (= *Catabomba*) as a Genus; Jour. N. Y. Ent. Soc., xviii, 58; 1910.

——— Studies on Syrphidæ: III, An Interesting Meristic Variation in *Syrphus perplexus; l. c.,* 62; 1910.

——— Syrphidæ of British Columbia; Can. Ent.

ROBERTSON, C. Some New Diptera; Can. Ent., xxxiii, 284; 1901.

SHANNON, R. C. An Eastern *Chilosia* with Hairy Eyes; Proc. Ent. Soc. Wash., xvii; 1915.

——— Captures of the Syrphid Fly *Merapioidus villosus* Bigot; *l. c.,* 147; 1915.

——— A New Eastern *Brachyopa;* Insec. Inscit. Mens., iii, 11; 1915.

——— Notes on Some Genera of Syrphidæ, with Descriptions of New Species; Proc. Ent. Soc. Wash., xviii, 101; 1916.

——— A Reclassification of the Subfamilies and Genera of the North American Syrphidæ; Bull. Brook. Ent. Soc., xvi, 65-72, 120-128; xvii, 30-42; 1921-'22.

SNOW, W. A. Diptera of Colorado and New Mexico (Syrphidæ); Kans. Univ. Quart., iii, 225; 1895.

——— Notes and Descriptions of Syrphidæ; Kans. Univ. Quart., i, 33; 1892.

TOWNSEND, C. H. T. Contributions to the Dipterology of North America: I, Syrphidæ; Trans. Am. Ent. Soc., xxii; 1895.

——— Notes on the Diptera of Baja, California; Proc. Cal. Acad. Sci., (2), iv, 593; 1895.

——— On a Collection of Diptera from the Lowlands of Rio Nautla in the State of Vera Cruz; An. and Mag. Nat. Hist., (6), xix, 15-34; xx, 20-33; 272-291; 1897.

——— Diptera from the Sacramento and White Mountains in Southern New Mexico; An. and Mag. Nat. Hist., (6), xix; Feb., 1897.

——— Diptera from the Lower Rio Grande or Tamaulipan Region of Texas; Jour. N. Y. Ent. Soc., v, 179; 1897.

VERRALL, G. H. British Flies, viii; 1901.

WALKER, FRANCIS. List of Dipt. in the British Museum, Part iii; 1849.

——— Diptera Saundersiana; 1850.

——— Diptera in the Collection of W. W. Saunders; Trans. Ent. Soc. Lond., (2), v, 228.

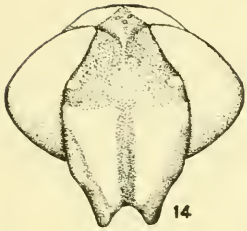
WALTON, W. R. Notes on Pennsylvania Diptera, with Two New Species of Syrphidæ; Ent. News, xxii, 318; 1911.

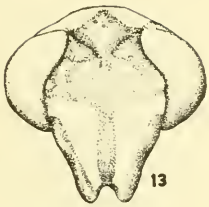
## PLATE I.

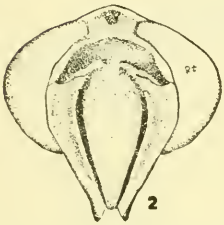
NOTE.—Where the species is numbered only the plate number is given beneath the specific heading, all figures bearing the same number as the species.

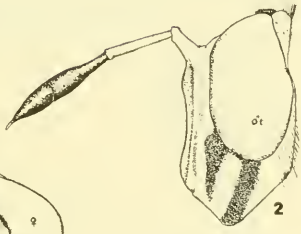
1. *Cerioides abdominalis* n. sp.; head.
2. *Cerioides captis* n. sp.; head, lateral and frontal view.
4. *Cerioides townsendi* Snow; head.
6. *Cerioides signifera* Loew; head.
7. *Cerioides ontarioensis* Curran; head.
10. *Cerioides tridens* Loew; head, lateral view.
11. *Cerioides ancoralis* Coquillett; head, lateral view.
13. *Cerioides proxima* n. sp.; head.
14. *Cerioides abbreviata* Loew; head.

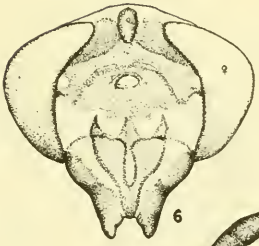
PLATE I.

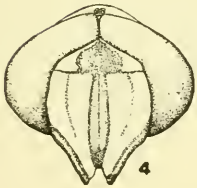


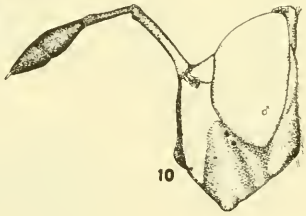


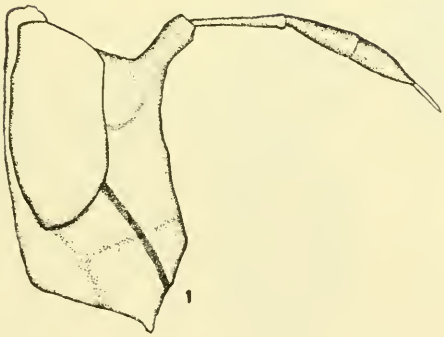



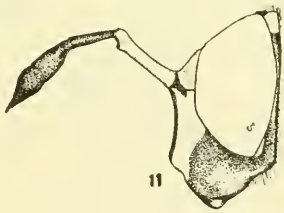



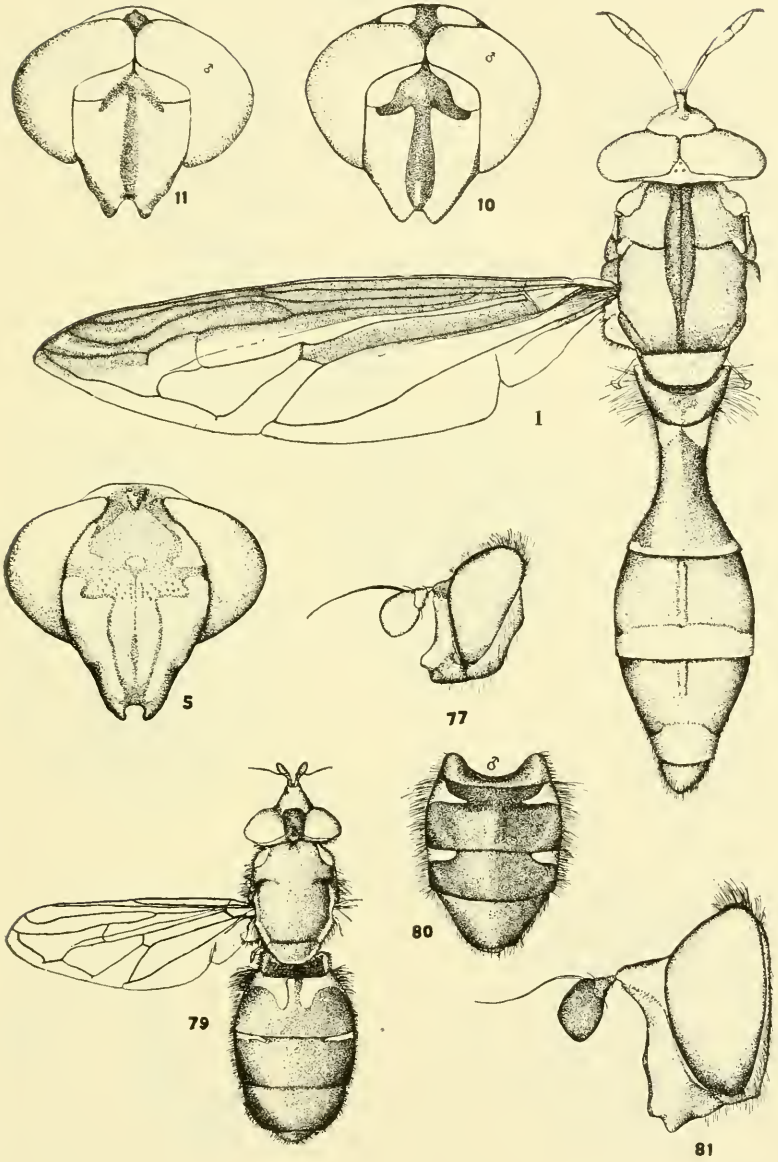



## PLATE II.

1. *Cerioides abdominalis* n. sp.
5. *Cerioides pedicellata* Williston; head.
10. *Cerioides tridens* Loew; head.
11. *Cerioides ancoralis* Coquillett; head.
77. *Cynorhina nigripes* n. sp.; head.
79. *Cynorhina pictipes* Bigot.
80. *Cynorhina notata* O. S.; abdomen.
81. *Cynorhina metcalfi* n. sp.; head.

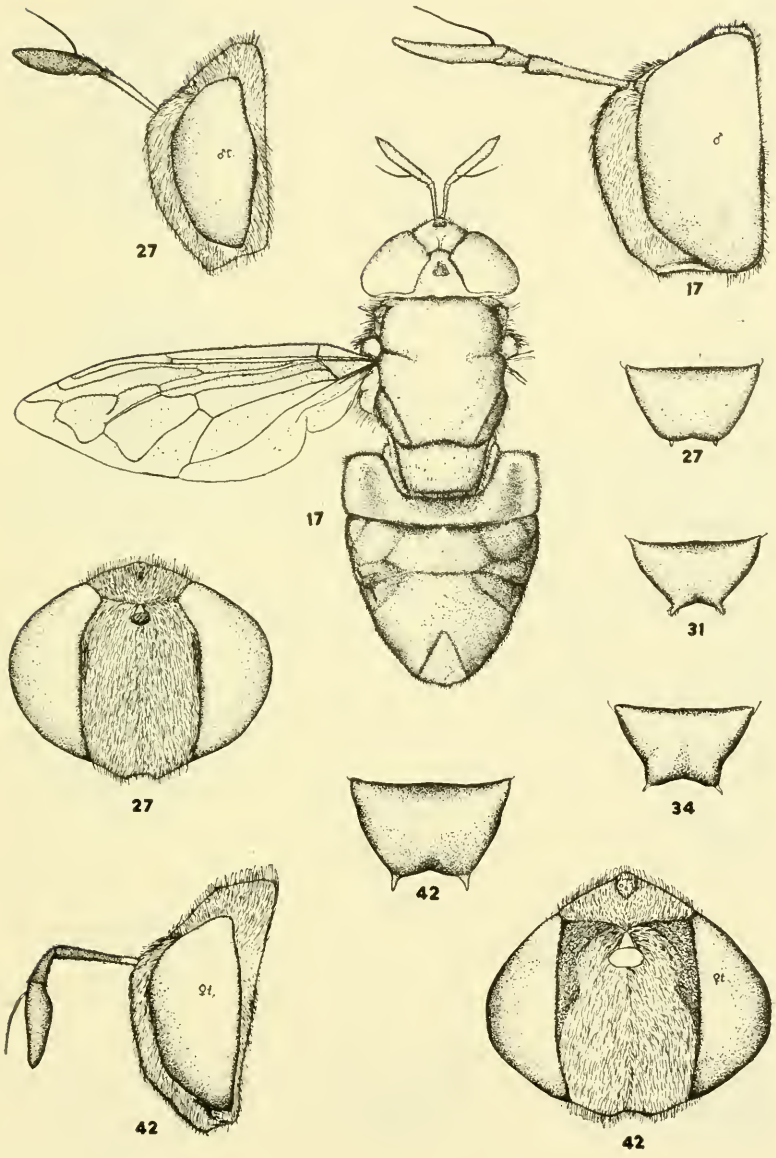
PLATE II.



## PLATE III.

17. *Microdon fulgens* Wiedemann.
27. *Microdon manitobensis* n. sp.; head, lateral and frontal view, and scutellum.
31. *Microdon ruficrus* Williston; scutellum.
34. *Microdon tristis* Loew; scutellum.
42. *Microdon ocellaris* n. sp.; head, lateral and frontal view, and scutellum.

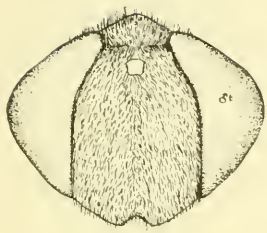
PLATE III.



## PLATE IV.

29. *Microdon cothurnatus* Bigot; scutellum.
33. *Microdon champlaini* n. sp.; head, frontal and lateral view, and scutellum.
35. *Microdon cutristis* n. sp.; head, frontal and lateral view, and scutellum.
37. *Microdon diversipilosis* n. sp.; head, frontal and lateral view, and scutellum.
39. *Microdon piperi* Knab; scutellum.
40. *Microdon basicornis* n. sp.; head, lateral view, and scutellum.

PLATE IV.

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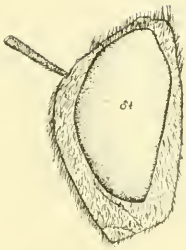


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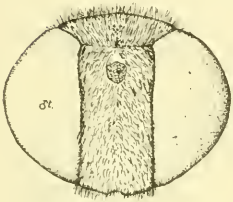


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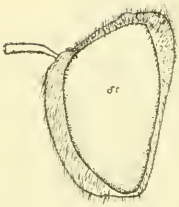


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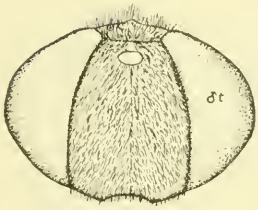


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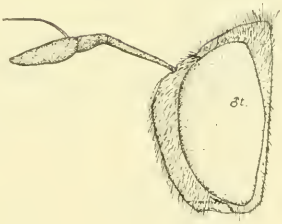


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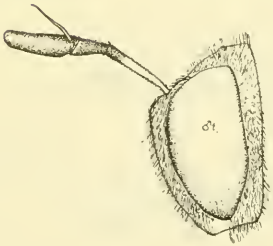


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## PLATE V.

20. *Microdon albipilis* n. sp.; head and scutellum.
21. *Microdon marmoratus* Bigot; head and scutellum.
22. *Microdon pscudoglobosus* n. sp.; head and scutellum.
23. *Microdon conflictus* n. sp.; scutellum; the furrows sometimes absent.
29. *Microdon cothurnatus* Bigot; antenna.
31. *Microdon ruficrus* Williston; antenna.
32. *Microdon lanceolatus* Adams; antenna.
34. *Microdon tristis* Loew; antenna.
38. *Microdon fuscipennis* Macquart; antennæ, arista and scutellum.
39. *Microdon piperi* Knab; antenna.
41. *Microdon aurulentus* Wiedemann; antenna.
44. *Microdon craigheadi* Walton; antenna.
46. *Microdon* (*Omegasyrphus*) *coarctatus* Loew; scutellum and antenna.
47. *Microdon* (*Omegasyrphus*) *baliopterus* Loew; scutellum and antenna.
48. *Microdon* (*Omegasyrphus*) *painteri* Hull; scutellum and antenna.
49. *Microdon* (*Omegasyrphus*) *pallipennis* n. sp.; scutellum and antenna.

PLATE V.

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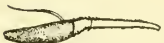
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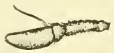
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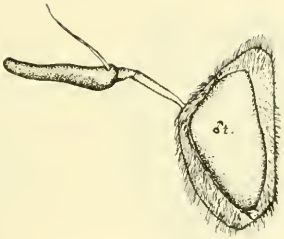
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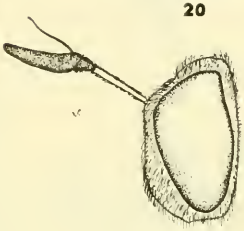
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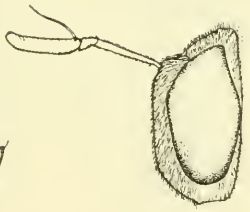
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## PLATE VI.

50. *Syrphus aberantis* n. sp.; head, abdomen and wing.
51. *Syrphus lotus* Willist.; head and abdomen.
53. *Stenosyrphus terminalis* n. sp.; head.
54. *Stenosyrphus imperialis* n. sp.; head.
55. *Stenosyrphus submarginalis* n. sp.; head.
58. *Stenosyrphus albipunctatus* n. sp.; head.
59. *Stenosyrphus diversipunctatus* n. sp.; head.
63. *Stenosyrphus subfasciatus* n. sp.; head.
108. *Stenosyrphus umbellatarum* Schiner; head of male specimen from Austria.

PLATE VI.

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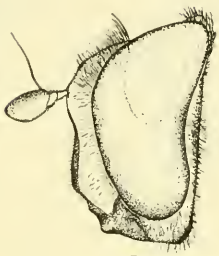
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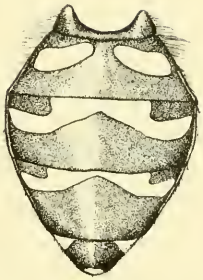
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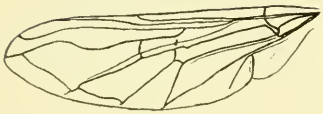
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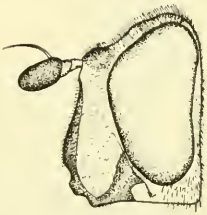
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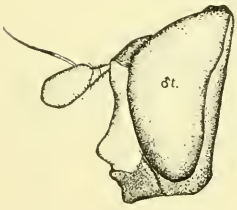

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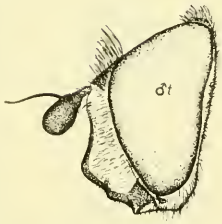

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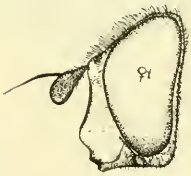

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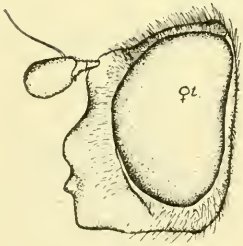

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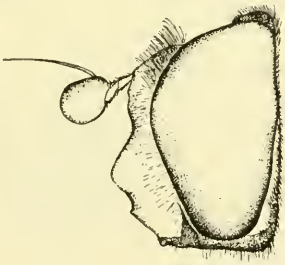
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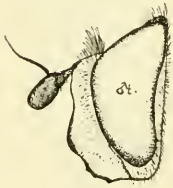

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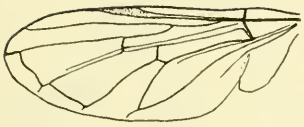
## PLATE VII.

64. *Melanostoma confusa* n. sp.; head.
65. *Melanostoma* atra n. sp.; head.
66. *Melanostoma luteipennis* n. sp.; head and wing.
68. *Chrysogaster nitidula* n. sp.; head, lateral and frontal views, and wing.
69. *Chrysogaster* (*Orthoneura*) *ontario* n. sp.; wing.
71. *Brachyopa basilaris* n. sp.; head, lateral and frontal views.
72. *Brachyopa nigricauda* n. sp.; female.
73. *Chalcomyia* (Chalcosyrphus) *atra* n. sp.; female and head.
104. *Chalcomyia area* Loew; wing of female.

PLATE VII.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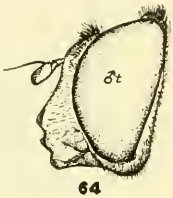

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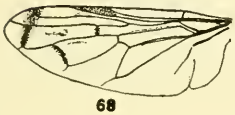
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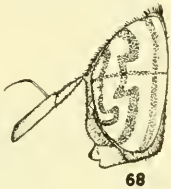
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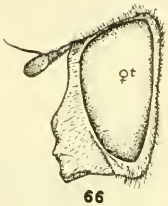

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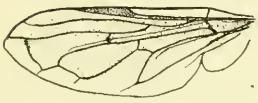
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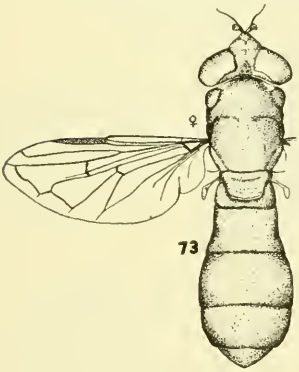

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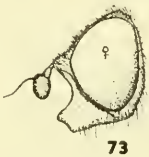

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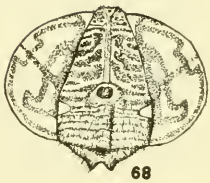
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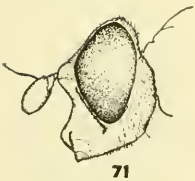
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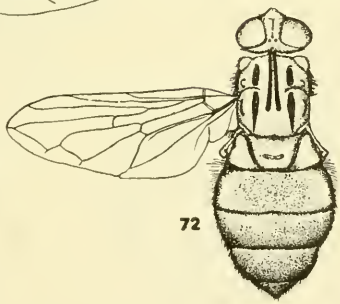
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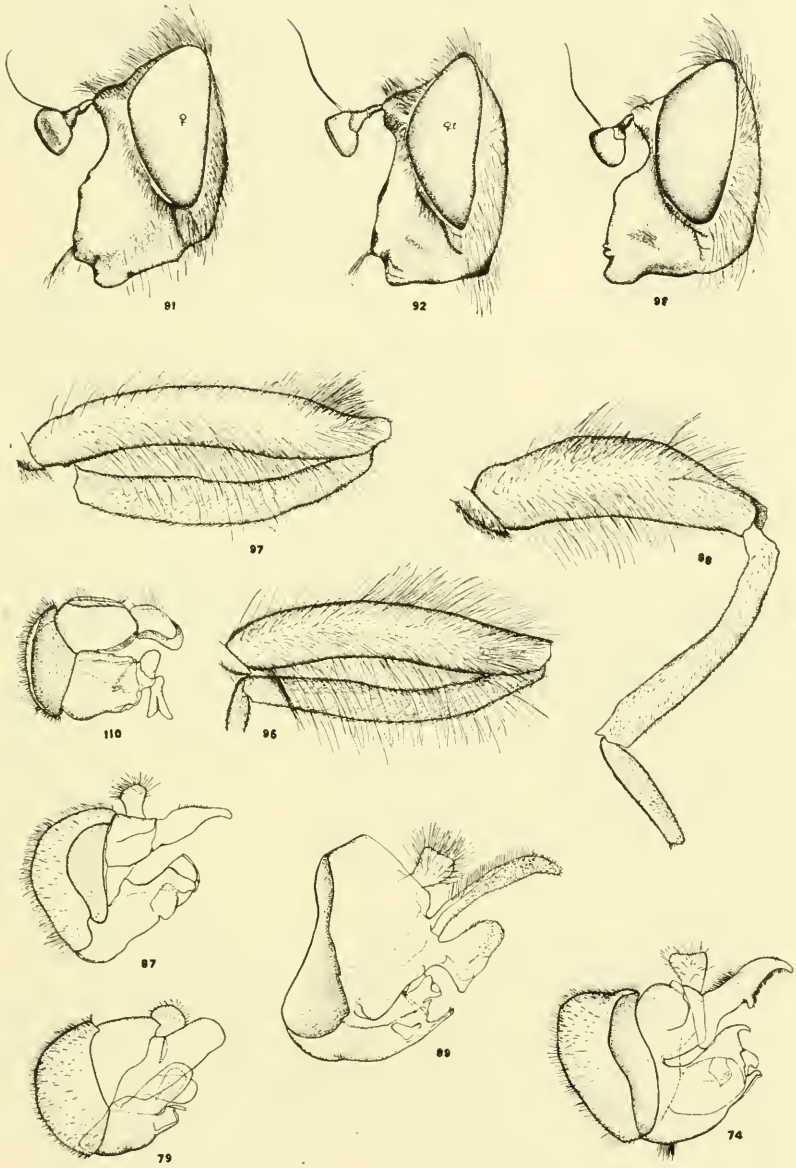
## PLATE VIII.

74. *Cynorhinella canadensis* Curran; lateral view of genitalia.
79. *Cynorhina nigra* Williston; lateral view of genitalia.
87. *Cynorhina humeralis* Williston; lateral view of genitalia.
89. *Cynorhina umbratillis* Williston; lateral view of genitalia.
91. *Criorhina luna* Lovett; lateral view of head.
92. *Criorhina mystaceæ* n. sp.; lateral view of head.
96. *Criorhina latipilosa* n. sp.; hind femora and tibia.
97. *Criorhina kincaidi* Coquillett; hind femora and tibia.
98. *Criorhina caudata* n. sp.; hind femora and tibia.
110. *Syrphus montanus* n. sp.; lateral view of genitalia.

PLATE VIII.



## PLATE IX.

4. *Cerioides townsedi* Snow; lateral view of genitalia.
14. *Cerioides abbreviata* Loew; lateral view of genitalia.
15. *Mixogaster breviventris* Kahl; lateral and ventral views of genitalia.
19. *Microdon globosus* Fabr.; lateral view of genitalia.
22. *Microdon pseudoglobosus* n. sp.; lateral view of genitalia.
23. *Microdon conflictus* n. sp.; lateral view of genitalia.
44. *Microdon craigheadi* Walton; lateral and ventral views of genitalia.
47. *Microdon baliopterus* Loew; lateral view of genitalia.
48. *Microdon painteri* Hull; lateral view of genitalia.
49. *Microdon pallipennis* n. sp.; lateral view of genitalia.

PLATE IX.

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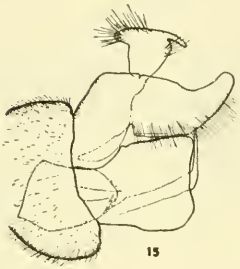
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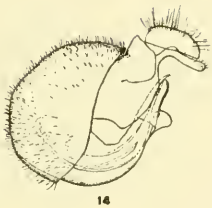
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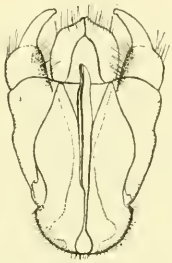
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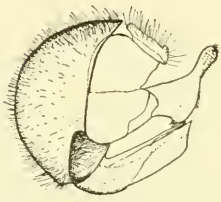
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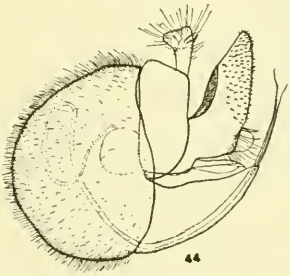
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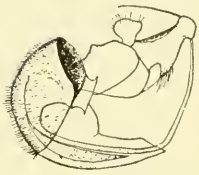
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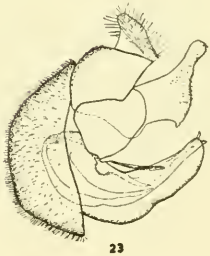
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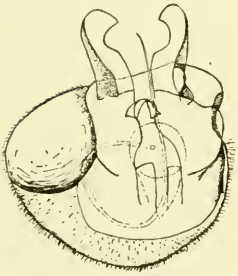
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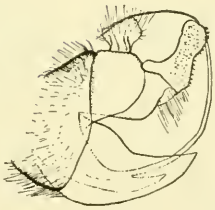
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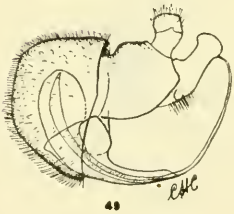
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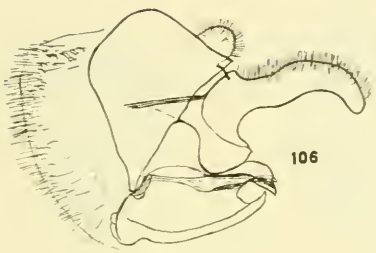
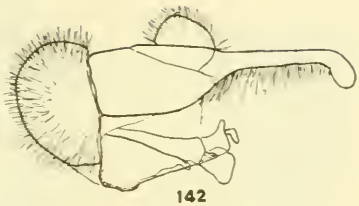
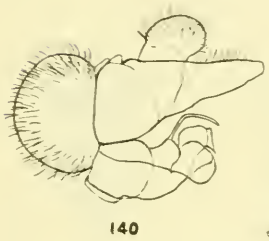
## PLATE X.

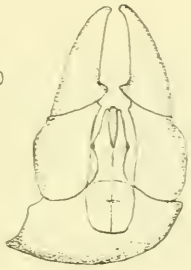
106. *Somula decora* Macquart; lateral view of genitalia.
140. *Volucella fasciata* Macq.; lateral view of genitalia.
141. *Volucella obesa* Fabr.; lateral view of genitalia.
142. *Volucella anna* Williston; lateral view of genitalia.
143. *Volucella violacea* Say; lateral view of genitalia.
144. *Volucella esuriens* Fabr.; lateral view of genitalia.
145. *Volucella picta* Wied.; ventral view of genitalia.
146. *Copestylum marginatum* Say; lateral view of genitalia.
147. *Eristalis latifrons* Loew; lateral view of genitalia.
148. *Eristalis aeneus* Fabr.; lateral view of genitalia.
150. *Eristalis tabanoides* Jaennicke; lateral view of genitalia.

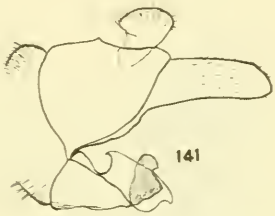
PLATE X.

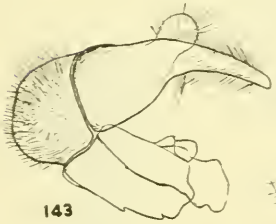


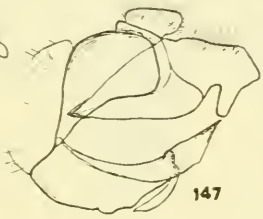



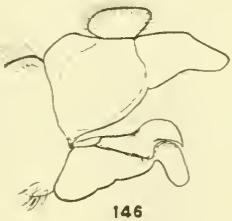



## PLATE XI.

59. *Stenosyrphus diversipunctatus* n. sp.; abdomen of male.
108. *Stenosyrphus umbellatarum* Schiner; abdomen of male.
110. *Syrphus montanus* n. sp.; abdomen of male.
139. *Stenosyrphus fisheri* Walton; abdomen of male.
151. *Syrphus laticaudus* n. sp.; abdomen of male.
152. *Syrphus laticaudatus* n. sp.; abdomen of female.
153. *Syrphus osburni* n. sp.; abdomen of male.
154. *Syrphus limatus* Hine; abdomen of female.
155. *Syrphus rufipunctatus* n. sp.; abdomen of female.
156. *Cartosyrphus plutonia* Hunter; lateral view of head.
157. *Chilosia ferruginea* Lovett; lateral view of head.
158. *Cartosyrphus tarda* Snow; lateral view of head.
159. *Cartosyrphus lucta* Snow; lateral view of head.

PLATE XI.

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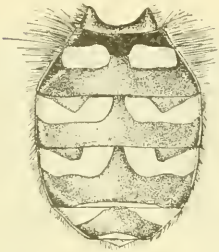
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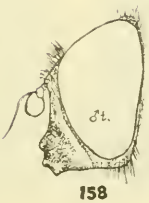
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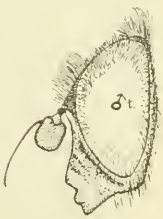
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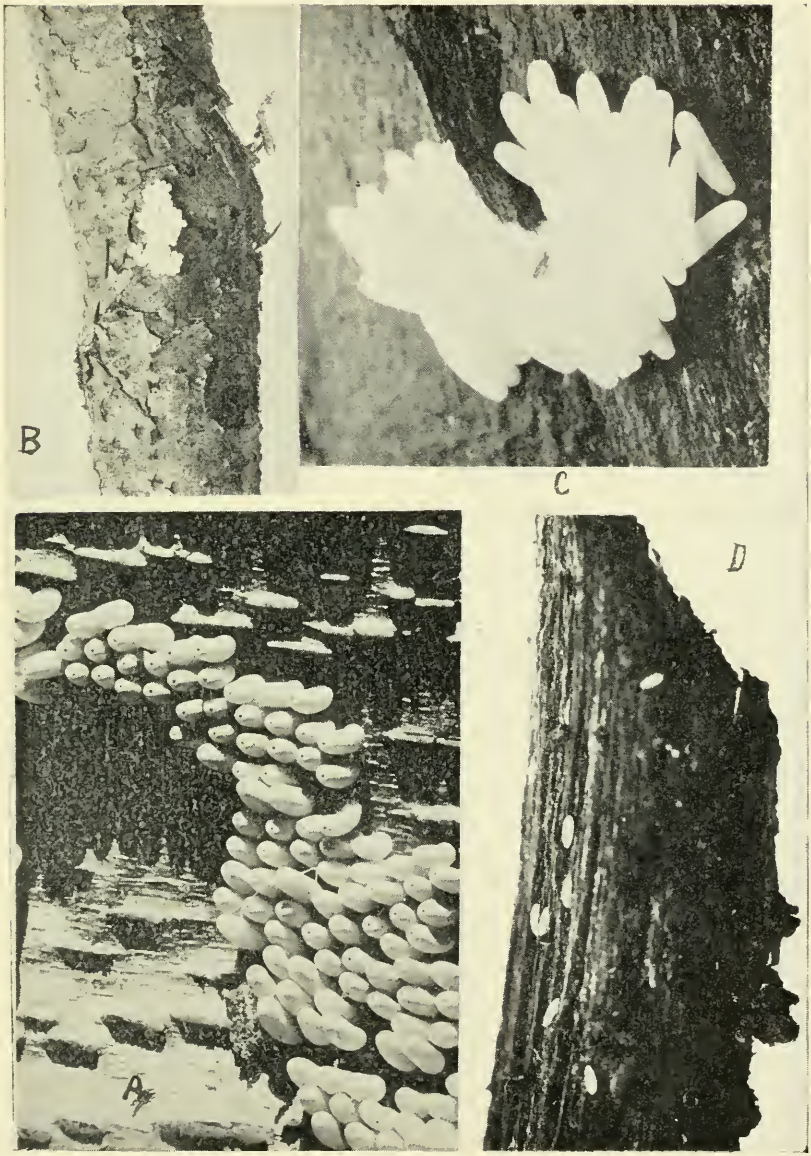
## PLATE XII.

A. *Helophilus similis* Loew; eggs on under side of bark of beech log. × 10.
B. *Helophilus similis* Loew; eggs on under side of twig overhanging pool. Natural size.
C. *Eristalis dimidiatus* Wiedemann; eggs laid in crevice of stick of wood lying in shallow water. × 10.
D. *Myiolepta?* sp.; eggs laid on dead wood above exuding sap. × 6.

PLATE XII.



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A COLLECTION OF FOSSIL FISHES IN THE UNIVERSITY OF KANSAS FROM THE NIOBRARA FORMATION OF THE CRETACEOUS.....*David Starr Jordan.*

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# A Collection of Fossil Fishes in the University of Kansas, from the Niobrara Formation of the Cretaceous.

DAVID STARR JORDAN,
President Emeritus, Leland Stanford, Jr., University.

NINE fossil fishes from the Niobrara formation of Cretaceous age have been sent to me for examination by Prof. Handel T. Martin, curator of vertebrate paleontology in the Dyche museum of natural history, University of Kansas. Notwithstanding the large collections already made from this region, five of these represent undescribed species. In all but two of these examples the body is better preserved than the head.* Most of the related species thus far described from the Niobrara are known from jaws and other fragments only—a fact which renders comparison difficult or impossible.

The provisional restorations of five of these species is the work of William Sackston Atkinson, natural history artist of Stanford University.

## FAMILY ANOGMIIDÆ.

### ANOGMIUS Cope.

(Type *Anogmius contractus* Cope.)

*? Anogmius* Cope. Proc. Amer. Phil. Soc. 1870, 170. (*A. contractus.*) Fragments of head from Niobrara formation.

*Anogmius* Cope. Proc. Amer. Phil. Soc. 1878, 178. (*contractus*, with two additional species.)

*Anogmius* Stewart. Geol. Surv. Kan. 1900, 340. (*Beryx polymicrodus* Stewart.) Perhaps not Anogmius Cope (1870). *A. contractus* Cope being, according to Cope, perhaps a fragment of *Pachyrhizodus*.

*? Tyrryptodus* Loomis. Palæontographica, XLVI, 1900, 229. (*T. zitteli* Loomis.) Part of a skull from Niobrara formation.

*? Pseudothryptodus* Loomis. Loc. cit., 236. (*P. intermedius* Loomis.) Same locality; regarded by Stewart as part of the maxillary of *Anogmius;* by Loomis as a ceratohyal.

* It appears that when the head is more or less intact its bones are in general destroyed. When single bones, as the jaws or opercles, are detached, they are well preserved. Perhaps oil or some other substance in the brain cavity causes neighboring bones to disintegrate, even when originally strong and firm, as in scorpænoid fishes.

This genus, as yet incompletely known, is based on parts of the skull of a very large fish. It is characterized, especially among clupeiform fishes, by the long and strong jaws, each covered with a mass of very short, equal, pitlike teeth, by the very strong ribs, and by the long, deeply caudal fin, of which the branching rays of the inner part of each lobe are very widely expanded.

The use of the name *Anogmius* for this genus may be open to question. It was defined by Cope, in 1870, from fragments he later referred to *Pachyrhizodus*, suggesting at the same time that if the American species of that genus should prove distinct from the European type (*basalis*) they might stand as *Anogmius*. *Pachyrhizodus* Dixon (1850) is regarded by Woodward as a synonym of *Raphiosaurus* Owen (1842).

Later (Proc. Am. Phil. Soc. 1878, 178) Cope seems to have changed this opinion, for he observes: "The characters of the genus *Anogmius* Cope having up to the present time rested upon but one species (*A. aratus*—a slip for *A. contractus*), it is satisfactory to confirm them by the study of new material." (*Anogmius evolutus* and *A. favirostris* Cope.) In view of this consideration, I follow Stewart in the use of the name *Anogmius*.

The family relationships of *Anogmius* are not clear. Stewart places it with the Osteoglossidæ, and Woodward, with not much better reason, among the Albulidæ. It is perhaps related to the genus *Plethodus*, which has similarly weak and numerous teeth. In the present chaotic state of the family arrangement of these genera of Cretaceous clupeiform fishes, *Anogmius* may well be the type of a distinct family.

### 1. *Anogmius polymicrodus* Stewart.

*Beryx polymicrodus* Stewart. Kan. Univ. Quart., VII, 195, 1898. (Jaws from western Kansas.)

*Anogmius polymicrodus* Stewart. Univ. Geol. Surv., VI, 1900.

Of this species I have received several fragments (No. 273), three of which I figure—the caudal fin, a maxillary, and a dentary (Plate XIII). The last is very broadly winged below and behind and covered above with a broad mass of minute teeth. I have also fragments of the sides of the body showing the very strong ribs.

The caudal fin closely resembles Stewart's figure (LXVI), evidently belonging to the same species. The upper lobe is broken, but the lower is perfect, its length being 11 inches. The diameter of a caudal vertebra is five-sixths of an inch. These are constricted, much deeper than long, coarsely and irregularly striate, rapidly reduced in size backward, the last four or five neural and hæmal spines

forming fulcra which increase rapidly in length behind. Caudal rays 15 + 15, much more numerous than shown in Stewart's figure; the first three short, perhaps to be regarded as fulcra; the next five slender, progressively lengthened and not branched; the next two a little longer, much widened, and profusely branched, each having from eight to fifteen branches, giving the rays a broomlike appearance. The next five rays are progressively shorter, but still more flattened and still more finely divided, from the middle outwards. Fourth long ray abruptly shorter than the third. Hypural well developed, much wrinkled, truncate at tip.

This specimen differs from Stewart's figure of the tail of *Anogmius polymicrodus* in having five shortened brushlike rays instead of three and in having the uppermost simple ray about as long as the longest brushlike rays. It may be that in Stewart's example the inner rays of each lobe had been cut off. The basal bones of the fulcra do not cross over or hide the last few vertebræ as in *Niobrara encarsia.*

A dentary bone (No. 283) of the mandible, probably from the same species, is somewhat broken, 5¾ inches long, very broad, and with a very broad striated wing below; its ridged striations, resembling coarse fin rays, widening posteriorly and extending the whole length of the bone. The whole dentary surface of the bone is covered with fine, even, close-set granulations or teeth of equal size, in about twenty obscure vermiculate rows, none of them sharp. These teeth are rather to be defined as little rounded pits in a harder matrix, well shown in Stewart's figure. The wing below the mandible is very much broader and longer than is shown in Stewart's plate (LXVII) of *Anogmius evolutus.* The tooth-bearing surface is flattened in front, wider in the middle, and overhanging on the sides. Another bone figured also, five inches long, is more slender, but of precisely the same nature, the band of teeth much narrower, the striations similar, the middle with a prominent compressed wing. This I take to be a maxillary. Other fragments show the very strong ribs of the species.

The other nominal species of this genus, all from Niobrara deposits in western Kansas—*A. contractus* Cope and *A. evolutus* Cope —are known from bones of the head only. *A. evolutus* seems to be distinct from the present species, having the lower jaw narrower and much less strongly winged. *A. contractus* is so scantily known that it cannot be compared with the others. The name *A. aratus* Cope seems to be a slip for *contractus,* as noticed by Stewart. (U. S. Geol. Surv. Kan., 344, 1900.)

## FAMILY NIOBRARIDÆ.

Those genera of large fishes which in the Cretaceous preceded the modern Clupeidæ, Engraulidæ and Dussumieriidæ have been referred, almost at random, to different families, as the Albulidæ, Chirocentridæ, Pterothrissidæ, Osteoglossidæ and Crossagnathidæ, and even to the Clupeidæ and Salmonidæ. Of these living families, but one, Pterothrissidæ, has a many-rayed dorsal. In this respect the genus *Niobrara* agrees with *Pterothrissus*. Presumably the others which we associate with *Niobrara* may have the dorsal similarly formed, but we do not yet know. But comparing *Niobrara* with *Pterothrissus gissu*, a common food fish of southern Japan, we find little else to indicate affinity. *Pterothrissus* has a slender body, little compressed, pectorals low down on the side, the lower side of the head with strong mucous cavities, the mouth small and inferior, the anal relatively few-rayed, inserted well behind the ventrals, the caudal widely forked and with numerous fulcra.

One extinct genus, *Isticus* Agassiz, of Europe, shows various traits of resemblance to *Pterothrissus*, and may belong to the Pterothrissidæ, but none of these genera of the Kansas Cretaceous shows much affinity with either, and they may be provisionally joined to form the family Niobraridæ.

### NIOBRARA Jordan, new genus.

(Type *Niobrara encarsia* Jordan.)

Body elliptical in form, compressed, tapering to a very slender caudal peduncle, which bears a long and deeply forked caudal fin; mouth moderate, with short jaws, the teeth apparently small, in one or two rows; scales large, smooth; vertebræ about 52, each deeper than long, much constricted, and with three shallow ridges and furrows; basic bones of the caudal fulcra decussating across the last vertebræ and the hypural. Dorsal fin many-rayed, beginning not far behind the head, elevated in front; anal fin obliterated, its interspinals beginning at end of body cavity, before tip of ventrals, the fin no doubt many-rayed; body cavity one-fourth longer than head; ventrals strong, inserted midway between middle of head and base of caudal; pectoral long, inserted high on the sides; caudal widely forked, its rays relatively few and strong, much branched at tip, with few fulcra.

*Niobrara encarsia* Jordan, n. sp.

No. 179. From the Niobrara Cretaceous, Trego county, Kansas. Collector, Harry Martin. (Plate XIV.)

A fine, large fish, complete and well preserved, except for the disintegration of the bones of the head, which cannot be made out in detail. Length, with caudal, 27 inches.

Head $6\frac{1}{6}$ times in length to base of caudal; depth, $4\frac{1}{2}$; caudal peduncle, 5; maxillary, about 3 in head; mandible, $2\frac{1}{3}$; pectoral fin, about $1\frac{1}{4}$ in head, its rays about 12; ventral, $2\frac{3}{4}$ in head, its rays 8; caudal lobes, $1\frac{1}{5}$ in head, the developed rays $6 + 6 = 12$; vertebræ, $20 + 31 = 51$; dorsal rays, about $10 + 30 = 40$; anal rays, probably 24 to 28.

Body elliptical elongate, deepest midway, with very slender caudal peduncle; sides considerably depressed, the ventral outline sharp, and perhaps serrate. Head so twisted towards the left and modified that few separate bones can be traced; eyes apparently small, location not evident; frontals each with a blunt projection; mouth moderate, the jaws apparently equal, the teeth almost wholly obliterated, a few traces of the small teeth on mandible; preopercle narrow, striate, with broadly obtuse angle; opercle rather sharply striate.

Scales all lost, except in a patch on sides of breast; those large, thin, smooth or slightly striate; vertebræ strong, deeper than long, mesially depressed, largest on the very slender caudal peduncle; anterior vertebræ with three shallow furrows, the posterior ones even above or with very slight longitudinal ridges; these vertebræ much deeper than long, those on the caudal peduncle with peculiarly arranged fulcra, their basal spines crossing the last vertebræ and the hypural. Caudal fin divided nearly to its base; its rays relatively few, strong, and much divided; upper fulcral neurals longer than lower. Ribs very long and strong, curved, each with a median furrow.

Dorsal fin inserted not far behind head, in front of middle of pectoral; neural spines strong, recurved; no evident interneurals; anterior rays of dorsal long, thick, flexible, tapering upward and curved, the longest $1\frac{2}{3}$ in head; about 10 long rays; posterior part of fin probably made up of low rays, of which no trace is left; anal fin probably very long, beginning midway between base of the pectorals and that of caudal, just before tip of ventrals. About nine anterior rays provided with strong interneurals, rather long, each

with a vertical groove; the fin rays entirely destroyed, but probably numerous; the fin high in front and very low posteriorly. Body cavity one-fourth longer than head.

Pectoral fin long, reaching nearly two-thirds distance to ventrals, its tip broken; the two upper rays strong, but not greatly enlarged; the insertion high; no free spine; ventrals strong, inserted posteriorly midway between middle of head and base of caudal with broad ridged pelvic plate, the outer rays strongest, the rays much branched at tip, the distance from gill opening 1⅓ times length of head. Caudal fin of two very long, narrow acute lobes, each of few rays very slender at tip, the fin spreading widely, apparently with fulcra at base, these partly lost, their basal bones singularly formed, crossing the hypural.

Name from ἐγκάρσιος, crosswise.

ZANCLITES Jordan, new genus.

(Type *Zanclites xenurus* Jordan.)

Body elongate-elliptical; moderately compressed with very slender caudal peduncle, and long, deeply forked caudal, the rays very slender and somewhat recurved; mouth small (the teeth and most bones of the head obliterated); vertebræ strong, about 56 in number; ribs very strong, grooved; last vertebræ not covered by interspinals.

Dorsal fin (obliterated) apparently long and low, many rayed; anal very long, as appears from the strong interhæmals; pectoral inserted rather high, short and broad, with twelve rays, none of them enlarged; ventrals very small and weak, six-rayed, inserted in middle of body. Body cavity about one-fourth shorter than head, interhæmals very long and strong, beginning close behind ventrals, the space presumably occupied by anal fin, half length from tip of snout to base of caudal; caudal of long and slender rays, which are little branched, the basal fulcra not crossing and hiding the last vertebræ as in *Niobrara*.

*Zanclites xenurus* Jordan, n. sp.

Type No. 52. Niobrara Cretaceous; one-half mile northeast of Gove City, Gove county, Kansas. Collector, Harry Martin. (Plate XV.)

A fine specimen, well preserved, except for the head and nape, and its dorsal and anal fins; length, 21½ inches, with caudal.

Head, 3½ in length to base of caudal; depth 3⅗; depth of caudal

peduncle, 3¾ in head; maxillary, about 4¼ in head; pectoral, about 2 in head; ventral, 8; caudal lobes about one-fifth longer than head; dorsal rays, about 50; anal, about 30; pectoral rays, about 12; ventral, 6; caudal, 16 + 12 = about 28, besides 6 to 8 fulcra on either side. Vertebræ, 18 + 38 = 56..

Body elliptical-elongate, apparently compressed, the ventral outline narrowed but no evidence of scutes; caudal peduncle slender, but less so than in *Niobrara*.

Head so crushed that few separate bones can be traced; eyes quite small; apparently shorter than snout; mouth rather small, its cleft about one-fourth length of head; jaws apparently equal, the teeth obliterated except for a single row of very small ones along edge of maxillary; preopercle short, striate; opercle large, much striate, rugose below.

Vertebræ strong, deeper than long, scarcely enlarged on caudal peduncle, the anterior vaguely striate or ridged, the median with a blunt process on the anterior lower part of each, this wanting on vertebræ of the peduncle, which are finely ridged; ribs long and strong, little curved, most of them with a median furrow; neural spines very strong, but short.

A little patch of scales behind pectorals and another on nape, these thin, smooth and well embedded, with traces of rivulations along the surface; probably about 50 in a series along sides, judging from their size; dorsal fin wholly obliterated, but probably long and low, judging from traces of interneurals; its insertion midway between eye and base of caudal; anal fin obliterated, but from traces of interneurals I infer, that its form was similar, its base about half length of body, its insertion midway between eye and base of caudal.

Pectoral fins apparently short and quite broad, not reaching ventrals, the rays quite slender, none of them widened. Ventrals very small, of slender rays, inserted near end of second fifth of body, not including caudal; pelvic bones small. Caudal very deeply forked, but not divided to base; the lobes long, narrow and pointed, the rays very slender, the upper lobe branchlike and curving outwards; base of fin slightly heterocercal; base of fin with numerous fulcra.

This fish is evidently allied to *Niobrara encarsia*, differing mainly in the small weak ventrals, the short, broad pectoral, the caudal, equally deeply forked, but with many more rays and these curiously recurved. It may lack the elevated dorsal of *Niobrara*, but this is not certain.

KANSANUS Jordan, new genus.

(Type *Kansanus martini* Jordan.)

This genus, known only from the head and shoulders of a large fish, seems to be allied to *Niobrara* and *Zanclites*, with which it agrees in general form and in the large, thin, cycloid scales, roughened somewhat, however, along the concentric striæ. It differs in the much larger mouth, the cleft half length of head, and stronger teeth in few rows, as also in the long, pointed pectoral fin, which is two-thirds length of head.

4. *Kansanus martini* Jordan, n. sp.

Type No. 128. From the Niobrara Cretaceous, six miles southeast of Gove City, Gove county, Kansas. Collector, Harry Martin. (Plate XVI.)

The head and pectoral fin of a large fish, with a few vertebræ, the head so crushed as to make identification of most of the bones uncertain.

Head rather deep, showing no occipital crest; snout moderately acute; mouth very large, its cleft straight, about half the length of head; lower jaw apparently somewhat included; a rather strong mandible with a median furrow, its edge with an irregular row of moderate conical subequal teeth; maxillary narrow. Bones of skull above rugose, striated, their outlines not traceable. A few large, smooth, thin scales evident on shoulder; these cycloid, finely striate, with very minute points over the surface of the striæ. Vertebræ behind head strong, deeper than long, the upper surface with two longitudinal striæ with four or five deep, rounded pits above. Actinosts rather strong; pectoral fin long, pointed, inserted high, with slender rays, 8 to 10 of them preserved, the upper longest, the fin about 1½ in head; none of the rays thickened. One pharyngeal bone preserved, oblong, quadrate, with very small, bluntish teeth.

LUXILITES Jordan, new genus.

(Type *Luxilites striolatus* Jordan.)

This species, known from the head alone, is distinguished by the small even teeth in its large mouth; by the large, deep, closely imbricated scales, suggesting those of the cyprinoid genus *Luxilus*, by the fine striation of its scales, by the coarser striation of most bones of the head; the presence of rough tubercles, resembling small scales, on the skin between the opercle and the subopercle and be-

tween the uppermost branchiostegals. Pectoral narrow, without greatly enlarged rays, inserted high, opposite lower part of opercle.

The relation of this genus are obscure, but it cannot be very far from *Kansanus* and *Niabrara*.

5. *Luxilites striolatus* Jordan, n. sp.

No. 295. Niobrara Cretaceous. A head badly broken, with some ribs, a few vertebræ and the base of the pectoral. Length of head about four inches. (Plate XVII.)

Body apparently compressed, covered, as far as seen, with smooth, closely imbricated scales, much deeper than long, each with very fine, lengthwise striæ. Preopercle broad, crescentic, set obliquely, with strong, diverging striæ at its angle, and other strong striæ below and above; the main shaft of the bone smooth; suborbital bones strong, quadrate; mandible broken, apparently rather strong; maxillary rather broad, smooth, its edge with a row of fine, even sharp teeth, whether in more than one row cannot be seen, these short and not very close set; mouth ending about under middle of eye; coarse prominences behind eye; opercle rather small, with rather fine striæ running downward and backward, its upper parts covered with small tubercles resembling scales; similar roughnesses in a patch separating the opercle from the subopercle, which is broad, smooth, finely striate and horizontally placed. Branchiostegals well exhibited (eleven distinct) probably fifteen in all, the upper broad and flat, parallel with the subopercle and growing progressively narrower downward, some small scalelike tubercles between each of the uppermost pairs; outline of the branchiostegal region forming an even curve. Shoulder girdle rather narrow, its bones, so far as seen, striate. Pectoral fin placed high, opposite lower part of opercle; the fin broken, the upper ray thickest; ten rays present, with no sign of more. Eight stout ribs present, these covered by the scales. The few vertebræ preserved are smallish, deeper than long, not much constricted.

FERRIFRONS Jordan, new genus.

(Type *Ferrifrons rugosus* Jordan.)

This genus seems to have much in common with *Niobrara*, differing in the hard casquelike covering of the head above the bones; this with the exposed parts of the shoulder girdle everywhere roughened with fine, blunt points or irregularly vermiculated striæ and in the low insertion of the pectorals. The body is very deep and compressed, tapering rapidly backward to a stoutish tail, which bears

a long, widely forked caudal somewhat like that of *Niobrara*. The scales are moderate, thickened, roundish, and with surface rough with small points. The pectoral and ventral fins are moderate in size, the dorsal and anal apparently many-rayed, the rays probably slenderer, the dorsal beginning over middle of head.

The low insertion of the pectoral fin in this genus, common to most physostomus fishes, separates it rather sharply from the Niobrarida, but I know of no other place for it. The bony casque suggests certain living Osteoglossidæ, which, however, *Ferrifrons* resembles in no other respects.

6. *Ferrifrons rugosus* Jordan, n. sp.

Type No. 296. A very large fish from the Niobrara Cretaceous, four miles northeast of Gove City, Gove county, Kansas. Collector, Harry Martin. Length, 24½ inches. (Plates XVIII and XIX.)

The specimen is in fair condition except the loss of the front of the head, including the snout and both jaws. The posterior part of the body is damaged and has been restored in plaster; the dorsal and most of the anal fin is wanting, the dorsal in the type being restored as in the genus *Phareodus*, which I am convinced is an incorrect interpretation, as the dorsal interneurals begin over the middle of the head not far behind the eye.

Head 3⅘ in length to base of caudal; greatest depth half length; dorsal and anal rays probably numerous; ventral rays, 6 or more; pectoral, 7 or more; caudal, $15 + 15 = 30$; the lobes as long as head; vertebræ about $25 + 40 = 65$; ribs, 18.

Body very deep, strongly compressed, pear-shaped in outline, the depth greatest just behind head, thence tapering backward to a short, rather thick caudal peduncle. Head deeper than long, its upper parts covered with a casque of thick bone, rugose with blunt points arranged in irregular wavy striæ; opercle and exposed part of shoulder girdle similarly rough with fine wavy striæ. Opercle moderate, about as deep as long. Orbit small, about 7 in head. Mouth entirely lost, but probably not large, as the joint of the quadrate bone to which the mandible was attached is just below middle of eye. Other bones of head so crushed as not to be certainly traceable. Ribs very strong, long, mostly channeled, covering a large abdominal cavity. Shoulder girdle crescentic. Neural bones high, those above shoulder long and slender, bearing equally long and slender interneurals. This indicates probably a rather high dorsal, beginning with one of the first interneurals just behind the

head. Posteriorly all the interneurals are lost, not represented in the plaster restoration. Anal fin apparently many-rayed; the interhæmals mostly lost, the first being very long, lanceolate, broadened below; a few anterior anal rays only present, these rather strong, indicating a very long fin somewhat elevated in front. Neural and hæmal bones generally long and strong.

Pectoral fin placed unusually low, with conspicuous actinosts, the fin mostly obliterated, but probably of moderate size. Ventral fins rather small, probably inserted just before middle of body, but in the type torn loose and adherent to the anal fin, the posterior rays of the latter being also misplaced and adherent to the side of the body. Caudal fin very long, widely and deeply forked; its lobes equal, pointed, as long as head; the outer rays 2½ times length of inner; all very slender, the basal interneurals covering the last vertebræ, which are turned upward as if heterocercal, but perhaps through distortion; rays all very slender.

Scales mostly lost, of moderate size (probably 50 to 60 in a longitudinal series) of rather thick texture, the surface rough with small points, as is the case with the bones of the head.

## FAMILY SYLLÆMIDÆ.

### APSOPELIX Cope.

*Apsopelix* Cope. Ann. Rept. U. S. Geol. Surv. Terr. 424, 1870. (*sauriformis.*) Benton Cretaceous.

?*Pelocorapis* Cope. Bull. U. S. Geol. Surv. Terr. 1874, 587, 1877. (*varius.*) Benton Cretaceous, at Sibley, Kan.

?*Leptichthys* Stewart. Amer. Geol., XXIV, 78, 1899. (*agilis.*) Niobrara Cretaceous. Logan county, Kansas.

We see no difference of importance to distinguish the genera *Apsopelix* and *Leptichthys*, except the anterior position of the dorsal in *Leptichthys*. But as the fin is not preserved in any specimen of *Apsopelix*, its position being indicated only by traces of slender interneurals, we do not know how much stress should be given to this difference. Our specimen shows a few weak interneurals above the ventrals, suggesting supposed place of the dorsal in *Apsopelix*. It is not impossible that the two genera may prove to be inseparable. *Pelocorapis*, also from the same district, is not very different from *Apsopelix*, which name, being older than the others, should be preserved should any or all prove to be identical with it.

This genus is perhaps related to *Syllæmus*, but I doubt if either belongs to the Crossognathidæ. The very low insertion of the pectorals and the backward position of the ventrals exclude all of these

fishes from the Percesoces, in which suborder Woodward places the Crossognathidæ. Cope puts *Syllæmus* with the Mugilidæ, an arrangement apparently quite impossible. In general appearance *Apsopelix* approaches the *Albulidæ*, but in *Albula* the inside of the mouth has large grinding teeth, while the jaws have feeble teeth only. For the present we may accept Syllæmidæ as a distinct family, near Albulidæ.

### 7. *Apsopelix sauriformis* Cope.

*Apsopelix sauriformis* Cope. Rept. U. S. Geol. Surv. Terr. 424; 1870. (Benton Cretaceous.)

A long and slender fish (No. 264), fairly preserved, from the Niobrara formation, Benton Cretaceous. Lincoln county, Kansas. Collector, Rev. W. S. Price. The head is broken and the vertical fins mostly destroyed. Length, with caudal, 17½ inches. (Plate XX.)

Head 3⅖ in length to base of caudal; depth, 4⅚; mandible, 2 in head; eye, 4¼; pectoral, 1⅘ in head; ventral, 2⅔; caudal lobes about 1½; pectoral rays about 12; ventral about 12; dorsal and anal mostly obliterated, the former with about 4 interneurals present, just before the ventrals apparently representing the last rays; caudal rays 9 + 9 = 18; vertebræ, 20 + 27 = 47; 20 from base of ventrals backward.

Body long and slender, compressed, deepest opposite ventral, the caudal peduncle slender, the belly apparently not cultrate; head long, low, its upper profile evenly rising; mouth very large, the narrow maxillary extending well beyond eye; with small, nearly even teeth; mandible strong, perhaps projecting.

Pectoral broad, inserted very low; ventrals broad, inserted very far back, rather nearer base of caudal than pectorals; rays of pectorals and ventrals all slender, the inner progressively so. Distance from base of pectoral to ventral, 2⅓ in body. Pelvic bone extremely large and broad, heart-shaped, basinlike, with a longitudinal bounding ridge. Caudal lobes strong; deeply but not widely forked; no trace of anal preserved, the fin, if existing, beginning not far behind ventrals and relatively short, as the caudal portion of the vertebral column is contained 3¾ times in body. No trace of dorsal except about 5 small interneurals just above insertion of ventrals and with a few detached broken rays further forward. There was probably a single short dorsal fin, as in *Leptichthys* and *Albula*.

Vertebræ small, about as deep as long, the anterior with a bluntish median ridge; traces of moderate-sized scales on different parts of

body. Abdominal cavity (filled with chalk in specimen examined) extending backward from ventral fin a distance about 1½ times length of fin.

In Mr. Atkinson's accompanying restoration (Plate XX) of this species, the dorsal is provisionally placed over the interneurals, as shown by our specimen. In *Leptichthys agilis*, as figured by Stewart, this fin is certainly further forward, over last third of the length of the pectoral.

### LEPTICHTHYS Stewart.

(Type *Leptichthys agilis* Stewart.)

This genus is closely related to *Apsopelix*, differing in the anterior insertion of the dorsal fin, which is well in advance of the ventrals. An imperfect specimen examined by me differs in some other respects from *Apsopelix*, especially in the smaller size of the ventrals.

In *Apsopelix sauriformis* the ventrals show 12 or 13 rays, the vertebræ (27 + 20 = 47) are shorter and smoother; the distance from caudal base to ventrals is 3 in distance to snout. Last interneurals of dorsal over ventrals.

In *Leptichthys agilis* the last-named distance is 3½ from ventrals to snout; ventral rays, 8; vertebræ (27 + 18 = 45) more elongate and three-ridged; dorsal all well before ventrals, its insertion above tip of pectorals.

In *Apsopelix sauriformis* the location of the dorsal has not been indicated, except indirectly, as involved in the statement of Stewart that it is farther back than in *Leptichthys*—a statement borne out by my example of *Apsopelix*. Nothing is known of the anal fin, if it exists, in either genus.

### 8. *Leptichthys agilis* Stewart.

*Leptichthys agilis* Stewart. Amer. Geol., XXIV, 79, 1899. Niobrara Cretaceous, Logan county, Kansas; Geol. Surv. Kansas, VI, 372; 1900; Plate LXXI, Fig. 1.

Of this species I have seen but one example, an imperfect head with vertebral column seen from below. This specimen is shown on Plate XXI. The differential characters I note are given above. If those do not indicate generic distinction, they mark at least distinct species of *Apsopelix*.

## FAMILY PHAREODONTIDÆ.

### EURYCHIR Jordan, new genus.

(Type *Eurychir lindleyi*, new genus.)

This genus seems closely allied to *Pharcodus* Leidy (*Dapedoglossus* Cope) differing in the larger mouth, smaller and more wide-set teeth, and in the enormous development of the first ray of the pectoral fin.

The specimen before me resembles *Phareodus testis* (Cope), differing in having the first pectoral ray enormously enlarged and flattened. In *Pharcodus testis* the ray is much narrower and has its inner edge more or less serrate. The mouth is larger, the teeth much shorter, thicker and less oppressed than in *Pharcodus*. For these reasons, and because *Pharcodus* is thus far known only from the Eocene, we give it a new name, generic and specific, the last in honor of my former student, Dr. Ernest H. Lindley, chancellor of the University of Kansas.

*Eurychir* must be allied to Phareodus, having the general form, so far as can be seen, with the elongate first ray of the pectoral characteristic of *Pharcodus*. According to Cope, *Pharcodus*, at first known from jaws only, is the same as his *Dapedoglossus*, in which case Leidy's name, being the older, must be accepted, although its author did not separate a generic diagnosis from the account of the species, *Pharcodus acutus*.

I doubt whether *Pharcodus* and *Eurychir* should be placed with the Osteoglossidæ. *Phareodus* agrees with *Osteoglossum* in the produced pectoral ray, and to some extent in the character of the scales, but the broad lunate caudal fin is very different from the small rounded fin of *Osteoglossum*. All the living Osteoglossidæ are large river fishes of the tropics, while these American forms must have been marine. In *Pharcodus* and *Eurychir* we find no trace of the bony casque characteristic of *Osteoglossum*.

### 9. *Eurychir lindleyi* Jordan, n. sp.

Type No. 249. From the Niobrara Cretaceous. Collector, Harry Martin.

A crushed head of a very large fish, with a few vertebæ and a broken pectoral fin. (Plates XXII and XXIII.) The first ray of this fin is very long and broad, its surface smooth and its edges entire, the ray narrowed towards the base. This fin, with its long and widened ray, must have been much longer than head, at least

five inches in length, its median width three times its basal width. The second ray is one-third the width of the upper one, being, like it, broadened mesially and towards the deeply divided tip.

Anterior vertebræ strong, longer than deep, with a single pit on lower side and without distinct groove or ridge above, each with robust transverse process for attachment of ribs; ribs very slender; mouth large, its length about two-thirds head; the mandible strong, with a single row of rather short, slender teeth, moderate, apparently in one row, those in front slightly larger, but with no trace of canines nor of an inner series. Teeth much shorter than those of *Phareodus testis*, not so slender, and not closely appressed.

The parts of the head can be traced, although misplaced. These are numbered on the plate as follows:

1. Mandible basally very broad, its oblique width two-fifths apparent length of head; the anterior portion with rather strong cylindrical wide set teeth; cleft of mouth straight.
2. Parasphenoid evident, rather long and strong, straight.

249. Preopercle strong, with a rounded anterior ridge.

3. Opercle broken, flat, roughish, but without radiating striæ, its form rather short and deep.
4. Gill structures narrow and the parts pressed together.
5. Quadrate bone obscure.
6. Pectoral spines of some other fish seen from the under side.
7. Coracoid, broad with a large foramen.
8. Scapula, broad, broken.
9. Cleithrum—lower part of inner side of shoulder girdle.
10. Articular facet of enlarged pectoral ray.
11. Actinosts strong.

This fish seems to be related to *Phareodus testis* Cope, characteristic of the Eocene Green river shales at Fossil, Wyoming. Compared with our photographs of the latter, it differs in the very much broader upper pectoral ray, and in the smaller, stouter and more widely separated teeth. *Phareodus testis* is a species of the Eocene, while our species belongs to the Cretaceous. *Phareodus acutus* Leidy (Proc. Ac. Nat. Sci. Phila., 1878, 99), from the Bridger Eocene, known from jaws only, is figured by Cope as having also teeth much larger and slenderer than those of *Eurychir lindleyi*.

## DESCRIPTION OF PLATES.

### PLATE XIII.

FIG. 1. *Anogmius polymicrodus* Stewart. Caudal fin. Cat. No. 273, K. U. museum.

FIGS. 2 and 3. *Anogmius polymicrodus*. Maxillary and dentary. Cat. No. 283, K. U. museum.

### PLATE XIV.

FIG. 1. *Niobrara encarsia* Jordan, new genus, new species. Type specimen. Cat. No. 179, K. U. museum.

FIG. 2. *Niobrara encarsia*. Restoration.

### PLATE XV.

FIG. 1. *Zanclites xenurus* Jordan, new genus, new species. Type specimen. Cat. No. 52, K. U. museum.

FIG. 2. *Zanclites xenurus* Jordan. Restoration.

### PLATE XVI.

*Kansanus martini* Jordan, new genus, new species. Type specimen. Cat. No. 128, K. U. museum.

### PLATE XVII.

*Luxilites striolatus* Jordan, new genus, new species. Type specimen. Cat. No. 295, K. U. museum.

### PLATE XVIII.

*Ferrifrons rugosus* Jordan, new genus, new species. Type specimen. Cat. No. 296, K. U. museum. (Partly restored, the dorsal fin fallacious, as also neural spines.)

### PLATE XIX.

*Ferrifrons rugosus* Jordan. Restoration.

### PLATE XX.

FIG. 1. *Apsopelix sauriformis* Cope. Cat. No. 264, K. U. museum.

FIG. 2. *Apsopelix sauriformis* Cope. Restoration.

### PLATE XXI.

*Leptichthys agilis* Stewart. Cat. No. 312, K. U. museum.

### PLATE XXII.

*Eurychir lindleyi* Jordan, new genus, new species. Type specimen. Cat. No. 249, K. U. museum.

### PLATE XXIII.

*Eurychir lindleyi* Jordan. Restoration.

PLATE XIII.

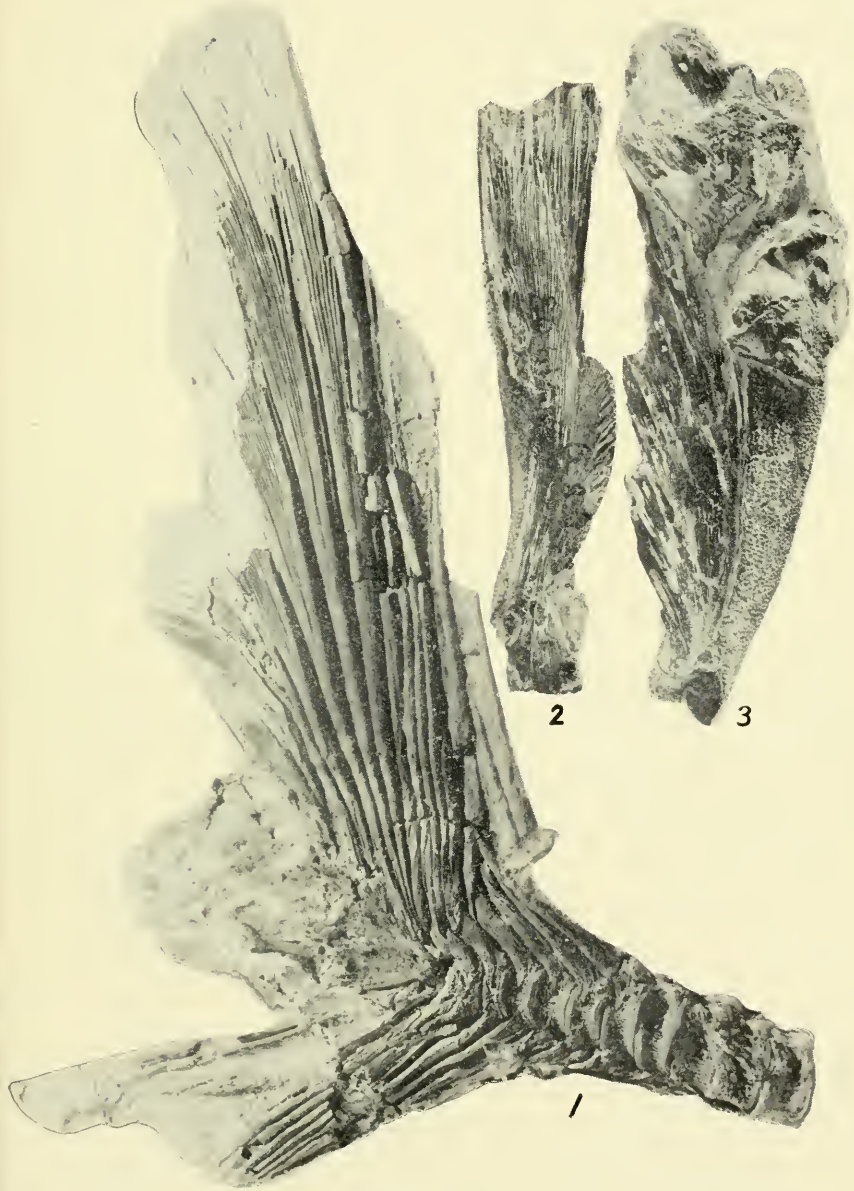


PLATE XIV.

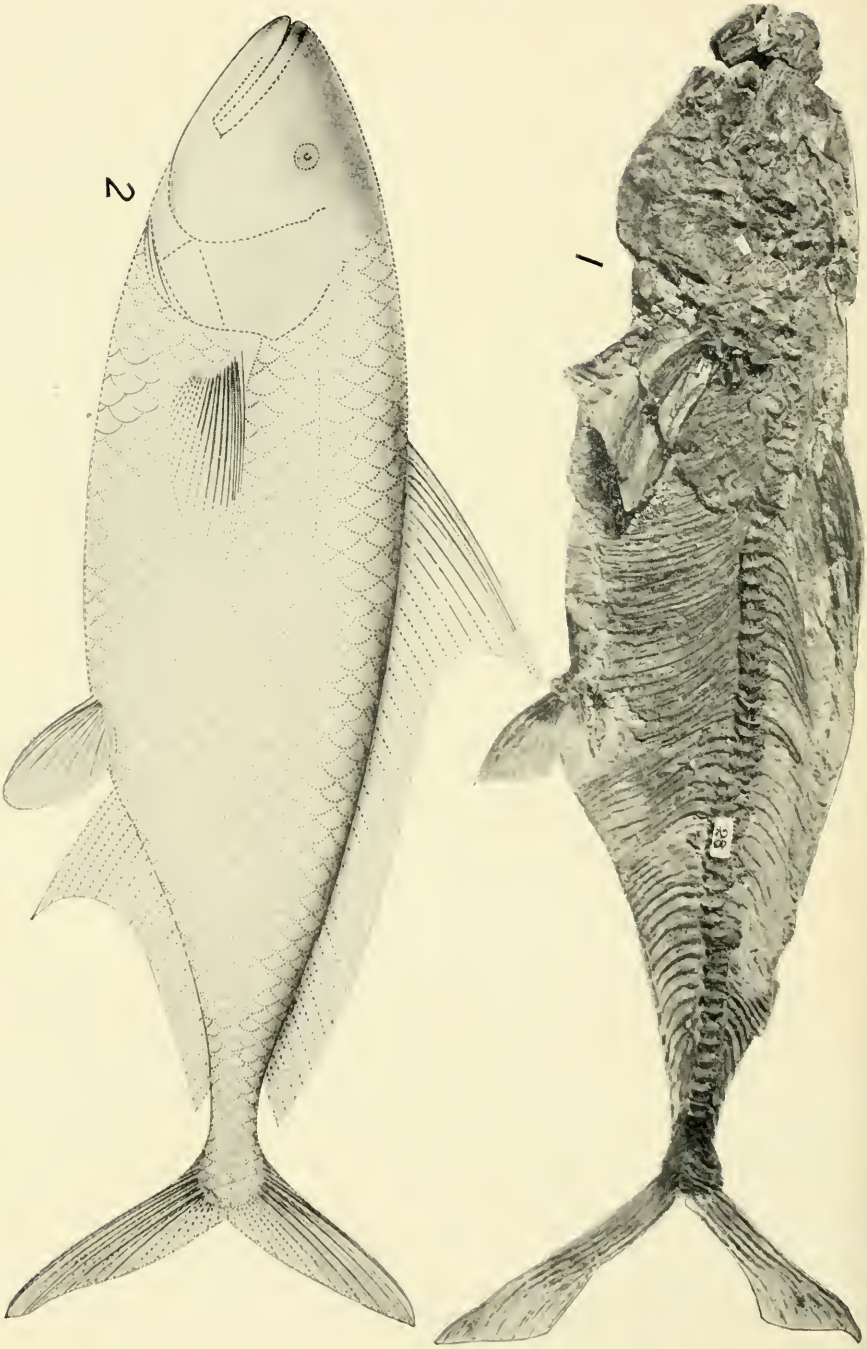


PLATE XV.

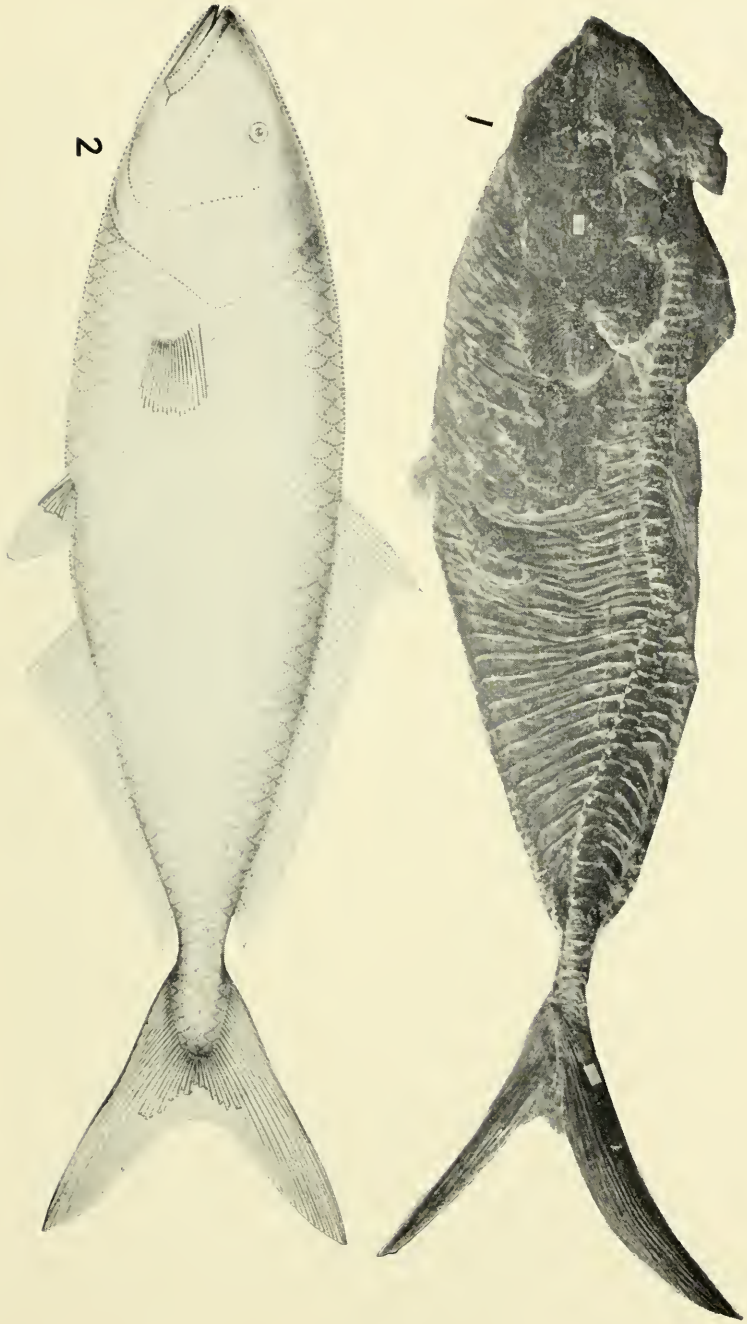


PLATE XVI.

PLATE XVII.

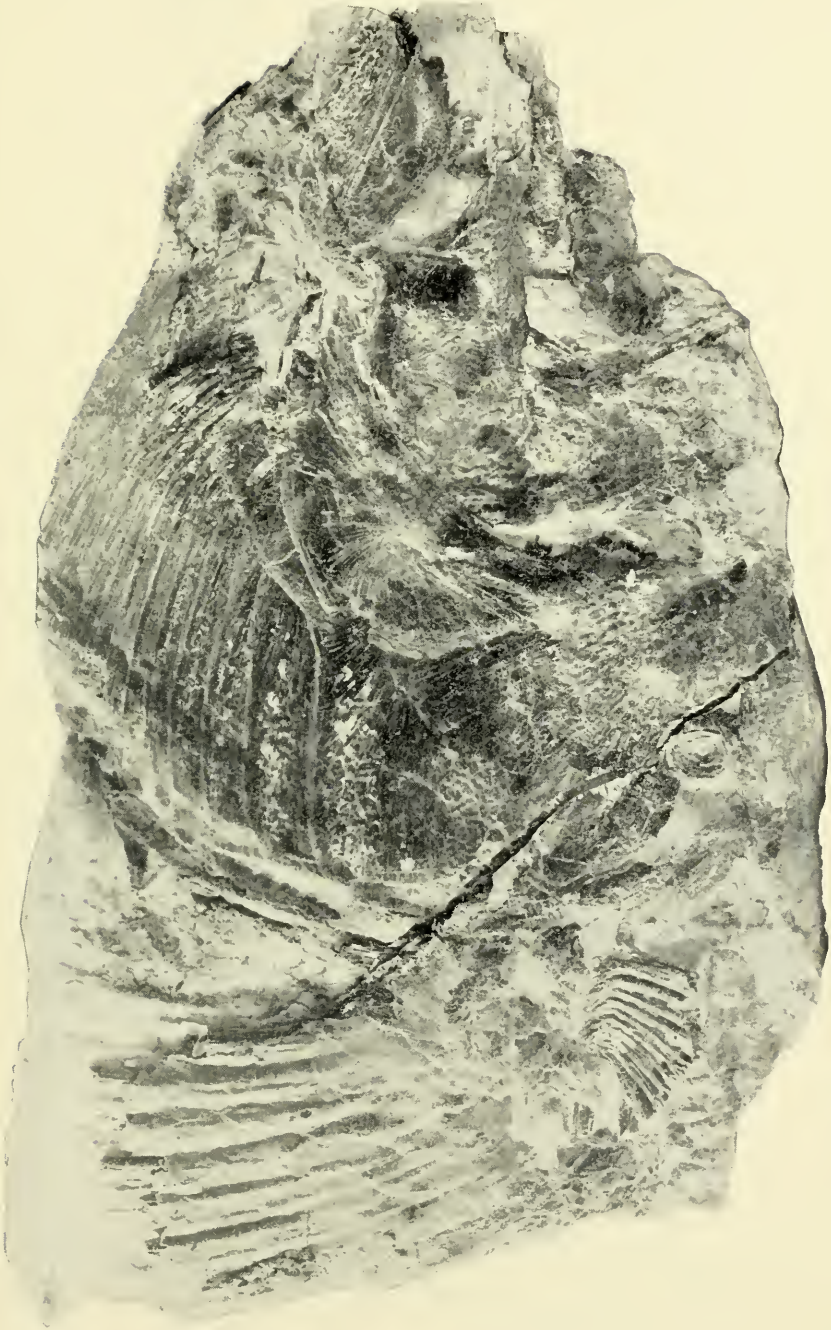


PLATE XVIII.

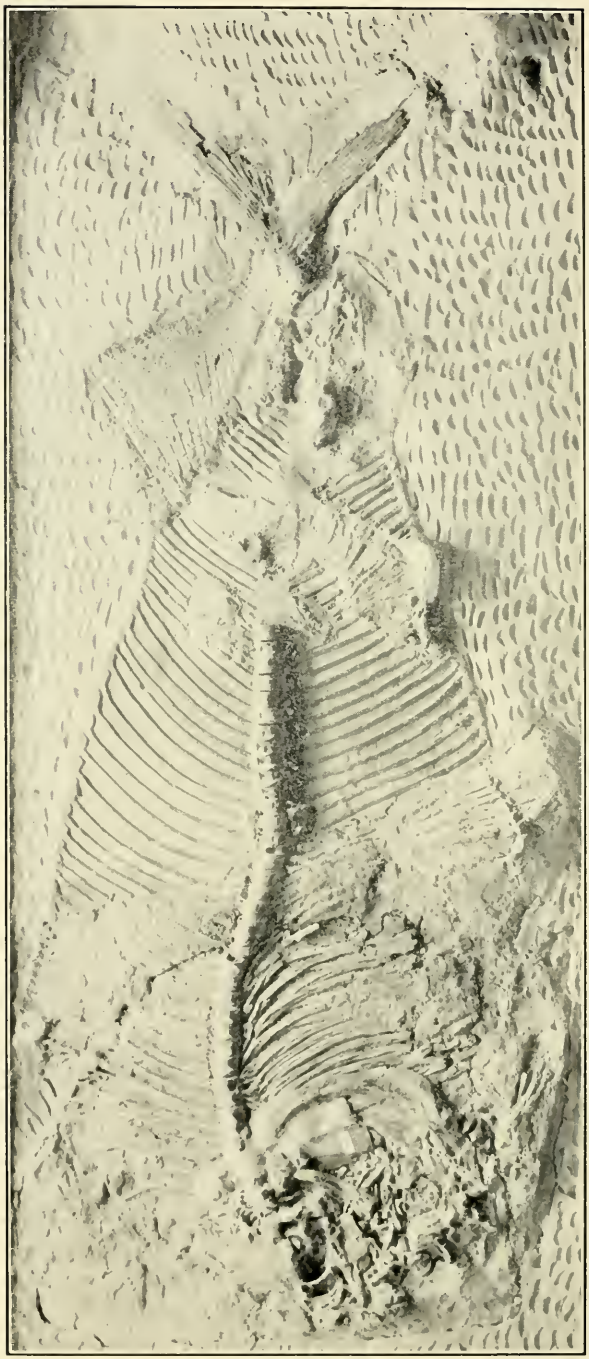


PLATE XIX.

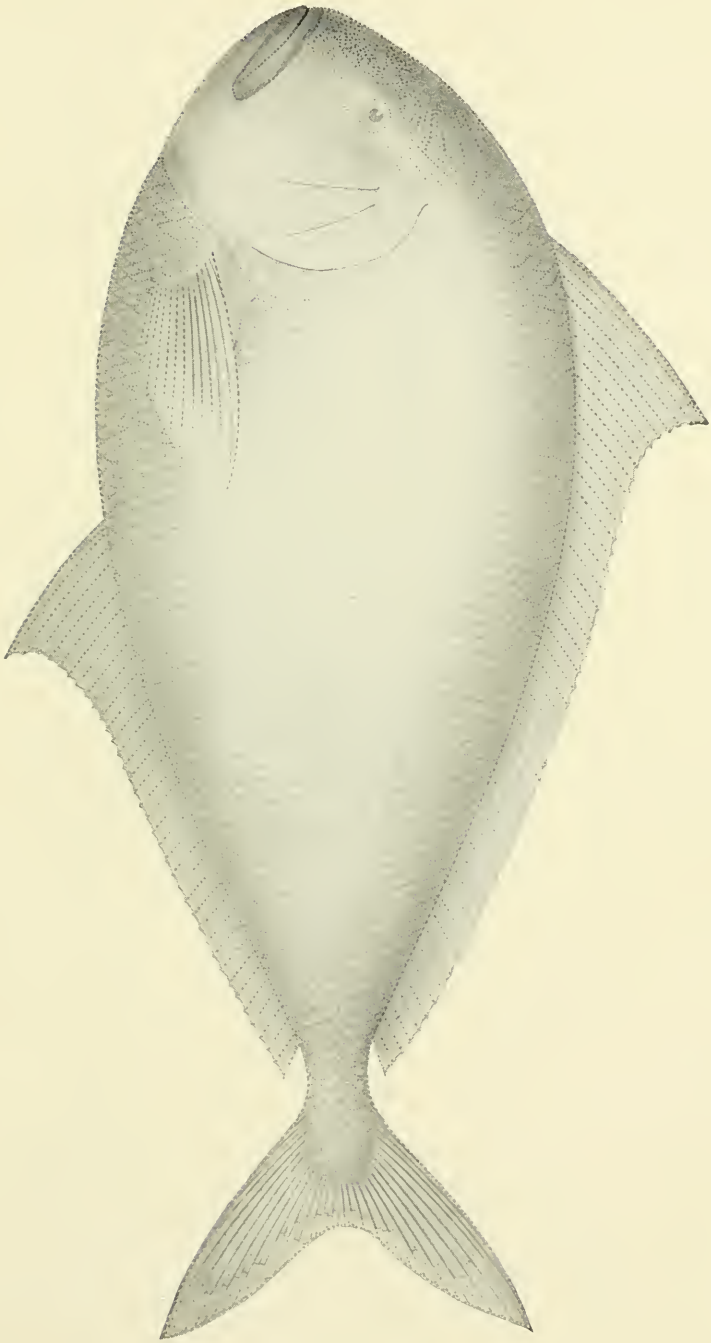


PLATE XX.

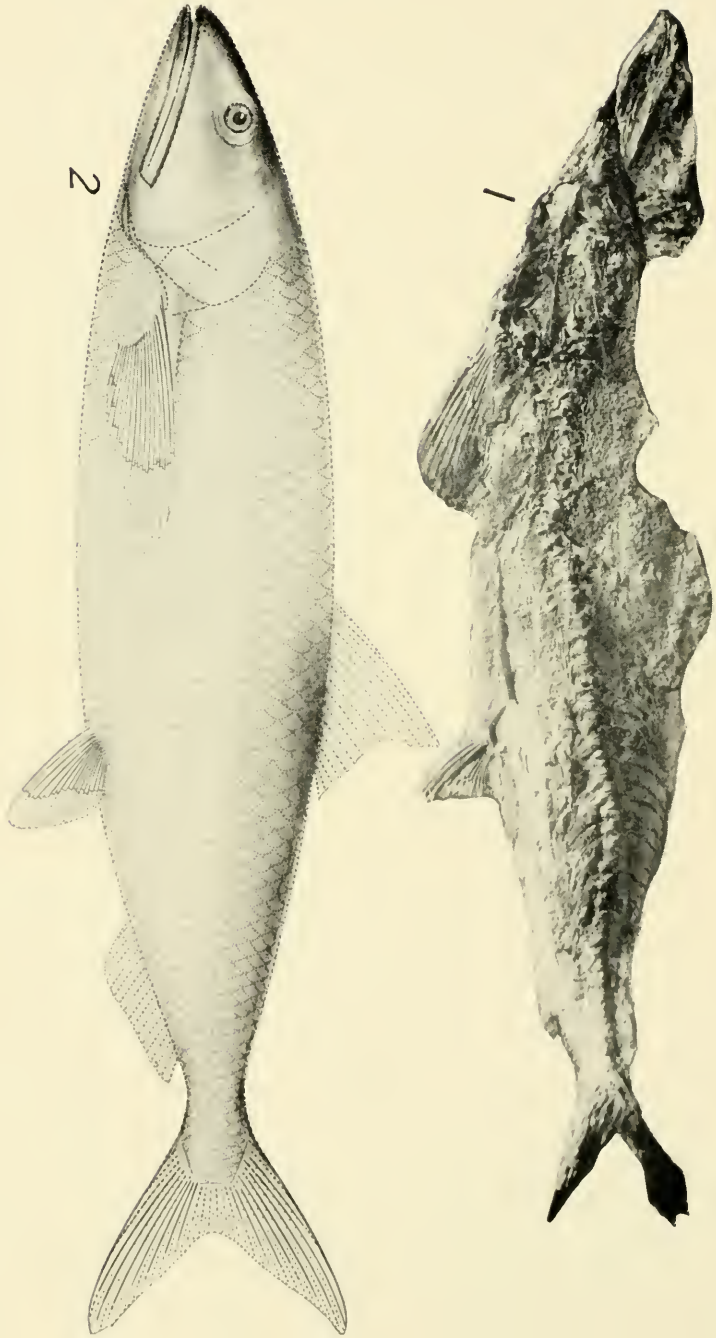
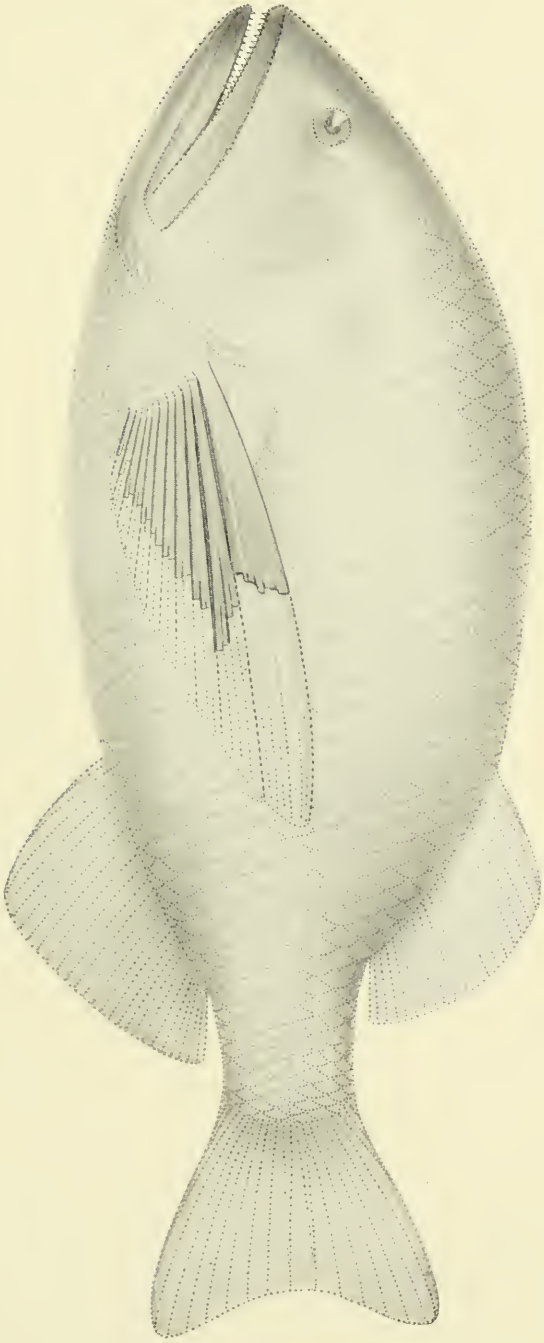


PLATE XXI.

PLATE XXII.

PLATE XXIII.



THE

KANSAS UNIVERSITY

# SCIENCE BULLETIN

VOL. XV, NO. 3—DECEMBER, 1924.

(Whole Series, Vol. XXV, No. 3.)

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CONTENTS:

A MECHANISM SHOWING A REMARKABLE CORRELATION BETWEEN STRUCTURE AND FUNCTION IN CONNECTION WITH THE NURSING REFLEX IN THE YOUNG MAMMAL ..... *H. H. Lane.*

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VOL. XV.] DECEMBER, 1924. [No. 3.

# A Mechanism Showing a Remarkable Correlation Between Structure and Function in Connection With the Nursing Reflex in the Young Mammal.[1]

H. H. LANE,
Department of Zoölogy.

IN THE ADULT MAMMAL four nerves are concerned with the innervation of the tongue, namely, the trigeminus, the facialis, the glossopharyngeus, and the hypoglossus. There is no little disagreement as to the rôle each of these nerves plays, especially with reference to the sense of taste. While seeking, if possible, to clear up some of the doubtful points, the present writer discovered a mechanism in the young rat and guinea pig which shows a remarkable correlation between structure and function in connection with the nursing reflex.

The material consists of a series of rat and guinea-pig embryos and fetuses, ranging in size from 13 mm. to five days after birth. The technique employed involved two well-known neurological methods. The first is a slightly modified form of the Bielchowski-Paton method, employing silver nitrate impregnation, followed by development with hydrochinone, dehydrating in alcohol, embedding in paraffin, and counter-staining of the sections with gold chloride. The second method used was the Ranson-Huber pyridine process, after decalcification in nitric acid. Both methods result in a differential staining of the nerve fibers so that there is visible a distinct contrast between them and other tissues.

In embryos of both the rat (13 and 23 mm.) and of the guinea pig (15 mm.) it was found that the posterior third of the upper

1. This is a portion of a paper entitled "*The Innervation of the Tongue,*" read at the fifth annual meeting of the American Society of Mammalogists, in Philadelphia, May 15, 1923. See *The Journal of Mammalogy*, vol. 4, No. 3, August, 1923, page 206.

surface of the tongue is innervated by a branch of the glossopharyngeus which passes posteriorly over, *i. e., dorsal to,* the cornu minus of the hyoid and ultimately reaches the distal extremity of the petrosal ganglion. It is clear, therefore, that the posterior third of the tongue in both the rat and the guinea pig is innervated by fibers which are a part of the glossopharyngeus. (See Plate XXIV, *G* and *g.*)

In the same specimens the anterior two-thirds or so of the tongue is innervated on either side by a well-defined trunk which passes posteriorly out of the root of the tongue and extends beneath, *i. e.*, ventral to, the cornu minus of the hyoid near its distal extremity, to the distal end of the petrosal ganglion, where this bundle of fibers divides into two approximately equal roots, one of which passes directly through this ganglion and ends in the motor area of the myelencephalon posterior to the ninth and tenth roots, and hence is to be recognized as the hypoglossus, or twelfth cranial nerve. (See Plate XXIV, *H.*) The second branch of this nerve trunk from the anterior two-thirds of the tongue leaves the main line at the level of the petrosal ganglion and pursues a course somewhat more caudad than the hypoglossus proper and ends in the ganglion of the *first cervical,* or the first of the spinal cord series. (See Plate XXVI, *Ci.*) The importance and significance of this fact will be considered presently.

Reverting to the trigeminus and facial nerves in relation to the tongue in these embryos, it was discovered that neither the lingual branch of the former nor the chorda tympani branch of the latter could be made out within the tongue in my preparations. If, as seems probable, they supply the innervation to the gustatory organs on the anterior two-thirds of the tongue in the adult, it is clear from these preparations that in these stages they have either not reached their terminations or are so insufficiently developed as to be indistinguishable. Since, however, as I have shown elsewhere,[2] the gustatory organs do not appear on the distal portion of the tongue until much later than these stages under consideration, I believe it is a fair inference that these special afferent fibers have not yet developed. At the very least, it must be admitted that they are playing a very minor rôle at this time, when both the glossopharyngeal and hypoglossal innervations of the tongue are well developed. This is a fact of striking significance.

2. "The Correlation between Structure and Function in the Development of the Special Senses of the White Rat," 1917, p. 57. Oklahoma University Studies No. 8.

The connection of the hypoglossus with the sensory portion of the first cervical is a fact of particular interest and importance, for it is clear that at birth the young rat must use his tongue for two purposes. First, it is a prehensile organ with a delicate tactile sense, by means of which the young rat feels for, discovers, and grasps the mother's nipple in order to obtain its nourishment. The posterior part of the tongue, supplied by the glossopharyngeus, on the other hand, is that portion of the tongue that will be washed by the milk stream when nursing, and so it is the seat of gustation in this early period. In short, the anatomical apparatus here described is clearly a demonstration of a strict correlation between structure and function—the anterior portion of the tongue in the nursling needs a tactile mechanism in order that the young rat may find its nipple and obtain food. The taste organs on the root of the tongue suffice to inform it of the flow of milk. This tactile mechanism is exactly provided for in the connection of the hypoglossal trunk with the first cervical ganglion. The hypoglossus (*wholly a motor nerve*) supplies the motor apparatus which governs the prehension displayed by the young rat's tongue; the first cervical supplies the afferent or sensory part of the reflex arc, which is concerned in the extraction of milk from the mother's nipple.

As I have shown in another place,[3] the gustatory organs over the anterior two-thirds of the tongue do not become functional until between the fifth and ninth days after birth, *i. e.*, not until the young rat is ready to begin nibbling at solid food. The sensory mechanism for gustation hence is much later in developing in this region than is the tactile apparatus, which must function much earlier. It would be hard to find a clearer or better illustration of the correlation between a structural mechanism and its function than this here described.

3. "The Correlation Between Structure and Function in the Development of the Special Senses of the White Rat," 1917, p. 57. Oklahoma University Studies No. 8.

## EXPLANATION OF PLATE XXIV.

Diagrammatic representation of the innervation of the tongue in the mammalian embryo (rat) of 13 mm. length. The ganglia connected with the cranial nerves, as well as the glossopharyngeus and hypoglossus nerves, are shown as projected upon a parasagittal section of the brain and the cervical portion of the spinal cord.

*5, 7, 9, 10,* represent the ganglia of the corresponding cranial nerves; *G,* nervus glossopharyngeus; *H,* nervus hypoglossus; *Ci,* sensory trunk of the first cervical nerve which joins the hypoglossal; *g,* gustatory area of the tongue; *t,* tactile area of the tongue; *h,* cornu minus of the hyoid.

PLATE XXIV.

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# SCIENCE BULLETIN

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CONTENTS:

THE INNERVATION OF THE SENSORY CELLS OF THE *Macula Acustica* IN THE RAT ..... *H. H. Lane.*

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VOL. XV.] DECEMBER, 1924. [No. 4.

# The Innervation of the Sensory Cells of the *Macula Acustica* in the Rat.*

H. H. LANE,
Department of Zoölogy.

THE auditory organ in vertebrates serves two distinct functions: (1) that of the perception of sound waves by the sensory cells of the organ of Corti; and (2) that of the maintenance of equilibrium through the instrumentality of sensory cells collected in certain groups constituting the so-called *maculæ* and *cristæ acusticæ*. The maculæ are small areas in the utricular and saccular portions of the membranous labyrinth, while the cristæ are elongated areas in the ampullæ of the semicircular canals. The cells constituting the maculæ and the cristæ have been studied in the past by various methods at the hands of Retzius, von Lenhossek and others, but with results not altogether satisfactory.

Perhaps the most definite account of these structures and their innervation in mammals is that of von Lenhossek (*Beiträge zur Histologie des Nervensystems und der Sinnesorgane;* Wiesbaden, 1894). His figure of the *macula acustica sacculi* of the mouse, from material prepared by the Golgi method, is that most frequently copied in various recent textbooks of histology, and represents the best of our knowledge heretofore available on this matter. This figure, redrawn from Dahlgren and Kepner's "Principles of Animal Histology," is reproduced here (Plate XXV, Fig. 1). It gives a typical Golgi picture—the uneven, knotted and twisted deposits of silver supposedly representing the nerve fibers as they pass through the basement membrane and divide to send similarly knotted and knarled

* This is the substance of a paper read before the American Society of Mammalogists, at its third annual meeting, in Washington, D. C., on May 3, 1921. See *Journal of Mammalogy*, vol. 2, No. 3, August, 1921, p. 185.

branches toward the sensory cells. Particular attention may be called to the strands of silver deposited along the sides of these sensory cells, and also to certain shorter branches extending downward toward the basement membrane. Valuable as the Golgi method has been and still is in revealing the structure of the nervous system, it is so uncertain in its results and so unreliable in giving a true picture of what it is intended to reveal that it is necessary to check the results of this method by others differing from it in principle.

In Plate XXV, Figure 2, is presented a view of the relation of the nerve endings to the sensory cells of the macula acustica in the rat, apparently very different from that shown in von Lenhossek's figure. It is evident that this view only completes the representation of the structures merely hinted at by the Golgi preparation. The material was obtained from a freshly killed five-day-old rat and was prepared by the well-known pyridine method of Ranson and Huber.

This preparation obviously gives a more complete picture of the actual structures present and shows that the sensory (hair) cells of the macula are surrounded by a palisade of fibers, derived from the vestibular nerve, which extend well up on all sides of these cells, so that no matter in what direction the head may be turned there is a nerve ending to receive the stimulus. These sensory cells and their surrounding nerve fibers are supported by a series of non-sensory cells resting upon a basement membrane, while the distal ends of both the sensory and the supporting cells are bounded by a cuticular or "cribriform" membrane, through the perforations in which extend the long, stiff, so-called "auditory" hairs into the cavity of the membranous labyrinth. The term "auditory" is so clearly a misnomer here that it is preferable to designate these structures merely as "sensory processes." These sensory processes are in life imbedded in a soft mucuslike substance that flows freely enough in response to changes in posture to stimulate the sensory cells through which the impulse is transferred to the proper adjacent nerve ending.

## EXPLANATION OF PLATE XXV.

FIG. 1. Redrawn from Dahlgren and Kepner's "Principles of Animal Histology"; it is von Lenhossek's figure of the innervation of the *macula acustica sacculi* of the mouse as revealed by the Golgi method of preparation.

FIG. 2. A semidiagrammatic representation of the same structure in the young rat as revealed by the pyridine method of Ranson and Huber. The sensory cells are shown surrounded with a "plisade" of nerve fibers.

PLATE XXV.

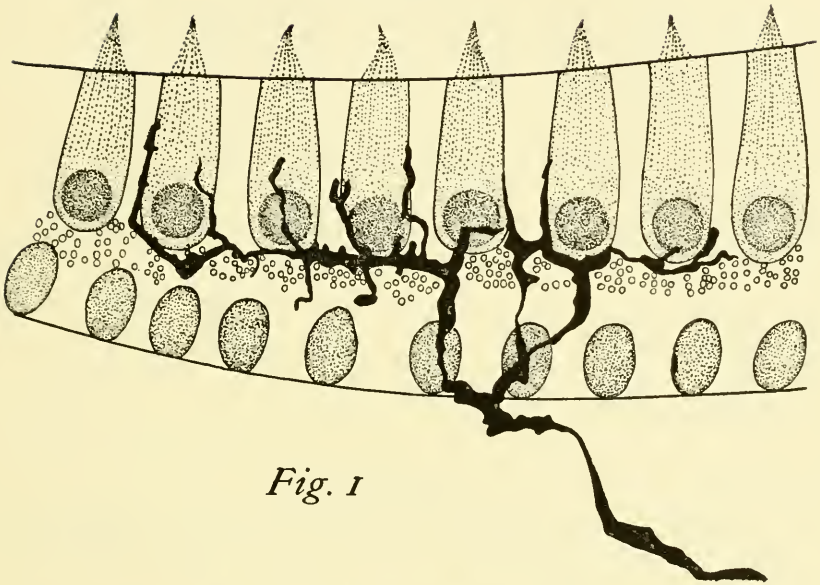

*Fig. 1*

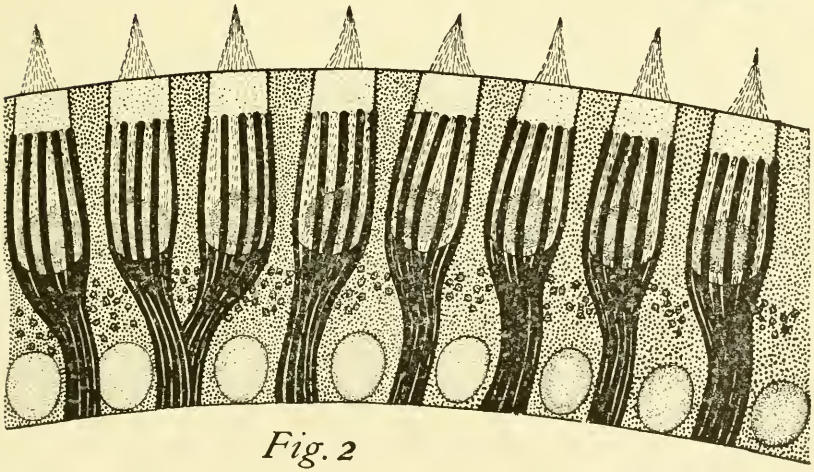

*Fig. 2*

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# SCIENCE BULLETIN

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THE REACTIONS OF THE FORMAMIDINES: XI, THE 2-THIO-4-THIAZOLIDONES,
*F. B. Dains and Silas J. Davis.*

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VOL. XV.] DECEMBER, 1924. [NO. 5.

# The Reactions of the Formamidines: XI, The 2-Thio-4-Thiazolidones.

F. B. DAINS and SILAS I. DAVIS,
Department of Chemistry.

THE previous papers in this field have shown that compounds containing methylene hydrogen, $=CH_2$, reacted with the aryl formamidines, RNHCH(NR), and gave aminomethylene derivatives of the type $>C=CHNHR$. Such activity was shown not only by open-chain compounds such as acetoacetic ester, malonic ester, etc., but also by ring derivatives such as the pyrazolones, thiazolidones and imidazolones. (1) For instance, diphenylformamidine and diphenylisothiohydantoin gave 2-phenyl-imino-3-phenyl-5-anilinomethylene-4-thiazolidone, $SC(NPh)NPhCOC=CHNHPh$.

Corresponding results were obtained in the case of the mono and the unsubstituted thiazolidones. (2)

The isomeric thioimidazolones showed the same behavior so far as the methylene group was concerned, but the interesting observation was made that the mono substituted derivatives

$$HN{-}CSNRCOC=CHNHR$$

were soluble in sodium hydroxide and formed thio ethers, just as were the corresponding aldehyde condensation products described by Wheeler and Johnson and their coworkers. (3)

In view of these facts, the 2-thio-4-thiazolidone,

$$\overset{1}{S}{-}\overset{2}{C}\overset{3}{S}NH(R)\overset{4}{C}O\overset{5}{C}H_2,$$

seemed worth investigating, since it contained the complex $-CO-CH_2S-$ of the ordinary thiazolidones, as well as the grouping $HN-CS-(=N-CSH-)$ of the thioimidazolones, and thus might

show the characteristic reactions of each type. The following experimental work has proved that this was the case. The 2-thio-4-thiazolidone not only gave aminomethylene and aldehyde condensation products at position 5, but also thio ethers at position 2. (4)

## PREPARATION OF THE THIAZOLIDONES.

2-THIO-4-THIAZOLIDONE. The method first described by Nencki was followed. (5) One molar weight of chloroacetic acid with double its weight of water was added to three molar weights of ammonium thiocyanate. The mixture was heated on the water bath to 70° or until the reaction started. Later it was often necessary to cool the flask to prevent overheating. The yield, 18%, was not especially good. The purified product melted at 165°.

2-THIO-3-PHENYL(ARYL)-4-THIAZOLIDONE. $\underline{S\text{–}CSNRCOCH_2}$.

The general procedure for the syntheses of the 3-substituted thiazolidones was as follows:

*Ammonium phenyldithiocarbonate,* PhNHCSSNH. (6) A mixture of 108 gms. of carbon disulfide and 150 gms. of ammonium hydroxide (28%) was placed in a tall beaker cooled with ice. To this was added, with constant stirring, 112 gms. of aniline. Precipitation of the salt was usually complete in an hour. The product was then filtered and washed with alcohol and ether. The ammonium salt (one mol.) was made into a paste with water and treated with a concentrated solution of sodium chloracetate, stirring meanwhile, preferably with a turbine. The reaction mixture was allowed to stand for an hour and diluted with water. The solution was filtered, if necessary, and then acidified with an excess of acetic acid. (Sulphuric or hydrochloric acid can also be used.) Precipitation of the thiazolidone was complete after twenty-four hours. The usual yields were from 60 to 75%. It was purified by recrystallization from alcohol.

$$PhNHCSSNH_4 + Cl.CH_2COONa = NH_4Cl + PhNHCSSCH_2COONa.$$

$$PhNHCSSCH_2COONa + HCl = NaCl + PhNHCSSCH_2COOH = \underline{S\text{–}CSNPhCOCH_2} + H_2O.$$

*2-Thio-3-tolylthiazolidone,* $\underline{S\text{–}CSN(C_7H_7)COCH_2}$, prepared as above separated from alcohol in golden yellow crystals which melted at 115°. Since the melting point in literature (7) was given as 101°, the accuracy of the formula was confirmed by analyses.

Analysis: Calc. for $C_{10}H_9ONS_2$: N, 6.28. Found, 6.31.

### CONDENSATION PRODUCTS OF THE THIAZOLIDONES WITH ALDEHYDES. (8)

These have been prepared in many cases, using sulphuric acid or sodium hydroxide as condensing agents. In this laboratory, piperidine has been found very satisfactory. Thus a solution of 2-thio-4-thiazolidone (18 gms.), benzaldehyde (14 gms.), in 200 cc. of absolute alcohol treated with a few drops of piperidine, gave an 83% yield of the 2-thio-5-benzal-4-thiazolidone. S–CSNHCOC = CHPh. (m. p. 200:).

### CONDENSATION OF THE THIAZOLIDONES WITH THE FORMAMIDINES.

*2-Thio-5-anilino-methylene-4-thiazolidone.* A molar mixture of diphenylformamidine and the thiazolidone was made into a thin paste with kerosene and then heated in an oil bath at 120° for one hour. Longer heating at higher temperatures should be avoided, since red, gummy decomposition products tend to be formed and the difficulties of purification are increased.

The reaction product was filtered, washed with a little cold alcohol and then recrystallized from alcohol. The yellow needles melted at 248°. The new compound, which was obtained in 46% yield, was soluble in hot alcohol and in aceton, difficultly soluble in benzene and gasoline and dissolved readily in sodium hydroxide solution.

$$S\text{–}CSNHCOCH_2 + C_6H_5NCHNHC_6H_5 = C_6H_5NH_2 + S\text{–}CSNHCOC = CHNHC_6H_5.$$

Analysis: : Calc. for $C_{10}H_8ON_2S_2$:N, 11.87. Found, 11.64.

## SUBSTITUTED THIAZOLIDONES.

### 2-THIO-3-PHENYL-5-ANILINO-METHYLENE-4-THIAZOLIDONE.

$$S\text{–}CS\text{–}N(C_6H_5)COC = CHNHC_6H_5.$$

This was made by heating a mixture of diphenylformamidine and 3-phenyl-thiazolidone in kerosene solution at 120-30°. The yellow crystals from alcohol melted at 247° and were difficultly soluble in the usual organic solvents.

Calc. for $C_{16}H_{12}ON_2S_2$:N, 8.98. Found, 8.77.

### CHEMICAL BEHAVIOR OF THE ABOVE ANILINO-METHYLENE DERIVATIVE.

(*a*) When heated for several hours on the water bath with alcoholic potassium hydroxide, the mole was completely disrupted, yielding as one product, aniline.

(*b*) When boiled with barium hydroxide the resulting solution contained barium sulphide and aniline and gave a positive test for the $HSCH_2CO$ radical, due doubtless to the formation of thioglycollic acid.

(*c*) It is much more stable toward acids. Very little decomposition was effected by heating for twelve hours with an alcoholic solution of hydrochloric acid.

(*d*) One gram of the substance in 30 cc. of alcohol was heated on the water bath for eight hours with four gms. of chloroacetic acid in 30 cc. of water. Under these conditions no desulfurization occurred.

(*e*) Aniline at 100° or 170° produced no change; but at 190° there was practically complete decomposition of the mole.

(*f*) The thiazolidone was boiled in alcohol solution for several hours with an excess of phenylhydrazine acetate. Hydrogen sulphide was evolved and from the solution was isolated a small amount of a reaction product, which separated from alcohol in dark red crystals with a melting point of 215°. It had a nitrogen content of 14.15% and may possibly be the 2-phenyl-hydrazone.

$$C_6H_5N\text{–}COC = CHNHC_6H_5$$
$$C_6H_5HNN:C\text{——}S$$

Analysis: Calc. for $C_{22}H_{18}ON_4S$; N:14.50.

Lack of time prevented further confirmation.

2–THIO–3–PHENYL–5–ALPHA–NAPHTHYL–AMINO–METHYLENE–4–THIAZOLIDONE.

$$S\text{–}CSN(C_6H_5)COC = CHNHC_{10}H_7.$$

Equal mols of the dialphanaphthyformamidine and the phenylthiazolidone were heated in kerosene solution for four hours at 150°. The product was best purified from benzene and the yellow crystals melted at 279°. The yield was 36%.

Analysis: Calc. for $C_{20}H_{14}ON_2S_2$: N, 7.74. Found, 7.59.

2–THIO–3–PHENYL–5–p–METHOXY–ANILINO–METHYLENE–4–THIAZOLIDONE.

$$S\text{–}CSN(C_6H_5)COC = CHNHC_6H_4OCH_3.$$

The di-p-anisylformamidine and the phenylthiazolidone were heated under the usual conditions. The new compound crystallized from alcohol in yellow needles which melted at 158-60°.

Analysis: Calc. for $C_{17}H_{14}O_2N_2S_2$: N, 8.19. Found, 8:00.

2-THIO-3-p-TOLYL-5-ANILINO-METHYLENE-4-THIAZOLIDONE.

$$SCSN(C_7H_7)COC=CHNHC_6H_5.$$

In this case the condensation was carried out at 95°. The compound was difficultly soluble in hot alcohol, from which it crystallized in yellow needles with a melting point of 235°.

Analysis: Calc. for $C_{17}H_{14}ON_2S_2$:N, 8.59. Found, 8.54.

## THIO ETHERS.

It was mentioned earlier in this article that the methylene substituted derivatives with the 3-position free could exist in an enol form, $S\text{–}C\text{–}(SH)NCOC=CHR$, a statement proven by the ease with which they formed thio ethers.

### THIO ETHERS FROM ALDEHYDE CONDENSATION PRODUCTS.

2-BENZYL-THIO-5-BENZAL-4-THIAZOLIDONE.

$$SC(SCH_2C_6H_5)N\text{–}COC=CHC_6H_5.$$

The benzal-thiazolidone (10 gms.) was dissolved in 10% sodium hydroxide and to this was added benzyl chloride (6 gms.) in 150 cc. of water. The mixture was shaken thoroughly and allowed to stand for twenty-four hours. The crude precipitate, which was obtained in 96% yield, was purified from alcohol. The light-colored crystals melted at 123°.

Analysis: Calc. for $C_{17}H_{13}ONS_2$:N, 4.50. Found, 4.52.

2-BENZYL-THIO-5-CINNAMAL-4-THIAZOLIDONE.

$$S\text{–}C(SCH_2C_6H_5)NCOC=CH:CHCHC_6H_5.$$

In this case an alcoholic solution of benzyl chloride was added to the cinnamal compound dissolved in sodium hydroxide. The ether was obtained in 88% yield, and after crystallization from alcohol, melted at 143°.

Analysis: Calc. for $C_{19}H_{15}ONS_2$:N, 4.15. Found, 4.11.

### THIO ETHERS FROM THE FORMAMIDINE CONDENSATION PRODUCTS.

2-ETHYL-THIO-5-ANILINO-METHYLENE-4-THIAZOLIDONE.

$$SC(S\text{–}C_2H_5)NCOC=CHNHC_6H_5.$$

The anilino compound was heated for an hour in alcohol solution with potassium hydroxide (1 mol.) and ethyl iodide. On cooling the greenish-yellow thio ether separated, and, when purified, melted at 175°.

Analysis: Calc. for $C_{12}H_{12}ON_2S_2$:N, 10.61. Found, 10.66.

2-BENZYL-THIO-5-ANILINO-METHYLENE-4-THIAZOLIDONE.
$S\text{–}C(SCH_2C_6H_5)NCOC = CHNHC_6H_5$.

This was obtained in quantitative yield by treating an alkaline solution of the thiazolidone with benzyl chloride. It is best purified by crystallization from benzene. The light-yellow needles from this solvent melted at 221-3°.

Analysis: Calc. for $C_{17}H_{14}ON_2S_2$:N, 8.59. Found, 8.67.

## SUMMARY.

(*a*) It has been shown that the 2-thio-thiazolidones react with the substituted formamidines, yielding 5-amino-methylene derivatives.

(*b*) The substituted aldehyde or aminomethylene thiazolidone which contains the grouping –CSNH or C–SHN =, give with ethyl or benzyl halide easily and smoothly the corresponding thio ethers.

(*c*) Several new compounds have been synthesized in illustrating the chemical behavior of the thio-thiazolidones. (9)

(1) Ber. Deut. Chem. Ges. 35, 2496 (1902).
Jour. Am. Chem. Soc. 31, 1148 (1909); 35, 959, 970 (1913); 38, 1510, 1841 (1916); 40, 562 (1918); 43, 613, 1200 (1921); 44, 2310 (1922).
(2) Jour. Am. Chem. Soc. 38, 1841 (1916); 43, 613 (1921).
(3) Jour. Am. Chem. Soc. 44, 2310 (1922).
Am. Chem. Jour. 45, 447 (1911).
(4) Bibliography of 2-Thio-Thiazolidones. Granacher-Helv. Chem. Acta III, 152.
(5) J. pr. Ch. (2) 16, 4 (1877).
(6) Kansas Univ. Sci. Bull., vol. 13, July, 1922. C. A. 17, 543 (1923).
(7) Monatsh. 26, 1192 (1905).
(8) Helv. Chem. Acta III, 158 (1920).
(9) The authors wish to thank the Research Committee of the University of Kansas for a grant which was of essential aid in this investigation.

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A NEW BISON FROM THE PLEISTOCENE OF KANSAS, WITH NOTICE OF NEW LOCALITY FOR *Bison occidentalis*.....*H. T. Martin.*

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THE KANSAS UNIVERSITY
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VOL. XV.] DECEMBER, 1924. [No. 6.

# A New Bison from the Pleistocene of Kansas, With Notice of a New Locality for *Bison occidentalis*.

H. T. MARTIN,
Curator of Vertebrate Paleontology.

IN the summer of 1909, while excavating for road-building material near Garden City, Finney county, Kansas, some workmen found the following-described remains of a new species of bison in the sand hills on the south side of the Arkansas river. The specimen was later secured by Mr. A. F. Osbun, of Garden City, who in 1910 forwarded it to the University of Kansas for identification. On learning of its scientific value he generously donated it to the museum of Kansas University.

*Bison willistoni* Martin, n. sp.

TYPE—No. 390, Department of Vertebrate Paleontology, University of Kansas Museum of Natural History. This specimen consists of a perfect left horn core, and a small portion of the left maxillary, in which is imbedded a part of the last upper molar. (Plate XXVI, Fig. 1; and Plate XXVII, Figs. 3, 3*a*.)

TYPE LOCALITY. South side of the Arkansas river, near Garden City, Finney county, Kansas, near north latitude 38° and west longitude 101°.

HORIZON. The specimen, according to information furnished by Mr. Osbun, was found at a depth of seven or eight feet below the surrounding prairie, in what was said to be a layer of "gyp" or mortar-bed formation—a sandy gravel held together by lime carbonate. Extensive exposures of these beds occur in the locality, particularly on the north side of the river, from a point just below Garden City to a distance of some twenty miles down the stream.

It is probable that the sand pit from which the specimen was obtained is located in a deposit of middle Pleistocene age, material from earlier mortarbed material (Tertiary) having been washed to this place as indicated in part by the presence of other bones associated with those of the bison. While at the time of discovery a number of these bones, including several teeth, were found in the pit, much of this material was later lost. Upon request, however, Mr. Osbun was able to secure some of the other bones and forwarded them to the museum. Among the material thus secured is a portion of a tooth of *Elephas primigenius,* a form very prevalent in the Kansas Pleistocene, and a lower premolar of a horse, which is very similar to *Equus excelsus.* The nature of the find, together with the data at hand, does not reveal a very close similarity to the conditions in the case of the *Bison occidentalis* found in Logan county, some eighty miles farther north. There appears to be a greater degree of petrifaction in the bones of *Bison willistoni* than in *Bison occidentalis*—a condition which should no doubt be attributed to a different and an earlier deposition of the layer in which the remains were found. There can be no doubt but that they represent an earlier Pleistocene fauna.

The new species here described and figured is named *Bison willistoni,* in honor of our late friend, the eminent student of vertebrate paleontology, Dr. S. W. Williston.

## THE HORN CORE.

It is unfortunate that more of the skull was not preserved with the horn core. The small fragment of the maxillary, with portions of the molar still imbedded within it, indicates, however, thicker walls and a much more heavily built skull than any yet described, and must represent an animal much larger and more robust than was *Bison occidentalis,* probably its nearest relative.

According to the classification proposed by F. A. Lucas[1] for American fossil bisons, *Bison willistoni* belongs to the group containing *B. occidentalis, B. kansensis* and *B. bison,* but it can be distinguished from any of these forms by the greater circumference of the horn core, and the more sharply upward curve of its distal fourth. The base of the horn core of *B. willistoni* does not sag, but, instead, rises in a gentle curve from the level of the skull for about three-fourths of its length, from which point it curves sharply to its tip, which terminates more obtusely than does that of *B. occidentalis.* (Compare Figs. 1 and 2, Plate XXVI.) In the following measure-

1. "The Fossil Bison of North America," Proc. of the U. S. National Museum, vol. XXI, pages 755-771. 1899.

ments, notice should be particularly directed to those of the transverse and vertical diameters of the horn core, which indicate that in *B. willistoni* the core is more flattened vertically along its whole length than is the case in *B. occidentalis,* the distal third of the latter being cylindrical in shape. McClung[2] gives the following measurements of the horn core in the other three species included in this group, to which are added the corresponding data for *B. willistoni.* All of these measurements were taken from specimens in the collection of the University of Kansas museum, and are given in millimeters.

| | *B. willistoni.* | *B. occidentalis.* | *B. kansensis.* | *B. bison.* |
|---|---|---|---|---|
| Circumference at base | 415 mm. | 343 mm. | 290 mm. | 253 mm. |
| Vertical diameter at base | 130 | 108 | 90 | 76 |
| Transverse diameter at base | 147 | 108 | 97 | 81 |
| Length of upper curve | 460 | 318 | 250 (est.) | 180 |
| Length of lower curve | 560 | 372 | 265 (est.) | 235 |

It is seen here that the horn core in *B. willistoni* is greater in all its dimensions than any of the other three; but whereas in *B. occidentalis* the vertical and transverse diameters at the base are identical, in *B. willistoni* the transverse diameter is 17 millimeters greater than the vertical, indicating the flattening already referred to as distinguishing this form from *B. occidentalis.* A similar flattening occurs in *B. kansensis* and *B. bison,* though in the former species the degree of flattening is relatively less, and in the latter relatively more than in *B. willistoni.* The basal circumference is 72 millimeters greater in *B. willistoni* than in *B. occidentalis,* which stands next to it in size, and the length along both the upper and lower curves is 142 and 88 millimeters, respectively, to the advantage of the former.

## THE MAXILLARY AND LAST LEFT UPPER MOLAR.

Figures 3 and 3*a,* Plate XXVII, show the crown and inner side views, natural size, of the maxillary fragment and the last upper molar in place, from the left side of *B. willistoni.* The grinding surface of the part of the tooth preserved is well worn down, giving evidence of having belonged to a very old individual. This wearing down of the crown is especially well marked in the hinder lobe of this tooth, from which the following measurements have been made:

| | |
|---|---|
| Estimated length of grinding surface | 45 mm. |
| Actual width across the posterior lobe | 32 |

2. "The Fossil Bison of Kansas," paper read before the Kansas Academy of Science, December 3, 1904.

Measurements of the corresponding tooth of *B. occidentalis* are as follows:

| | |
|---|---|
| Length of grinding surface | 33 mm. |
| Width of grinding surface | 25 |

These dimensions indicate a tooth size between one-fourth and one-third larger in *B. willistoni* than in *B. occidentalis.*

SECOND UPPER LEFT MOLAR.

Among the specimens submitted by Mr. Osbun is a bison tooth (catalogue number 391) found in a sand pit on the north side of Arkansas river, directly opposite the place where the other described remains were found. This is the second upper molar from the left side of a younger individual. Its size, as well as the pattern of the enamel folds, remove it from *B. occidentalis*, which form it most nearly resembles. Unless later finds should indicate that it represents another distinct species, I would identify this as belonging to a young individual of *B. willistoni.* This tooth is shown on Plate XXVII, Figures 4 and 4*a*, the former a crown view, the latter a side view. Of this tooth the following measurements have been made:

| | |
|---|---|
| From the base of the tooth to the level of the crest | 70 mm. |
| Extreme length of grinding surface of crown | 40 |
| Width across posterior lobe of grinding surface | 30 |

Corresponding measurements of the same tooth of *B. occidentalis:*

| | |
|---|---|
| From base of the tooth to level of the crest Est. | 52 mm. |
| Extreme length of grinding surface of crown | 32 |
| Width across posterior lobe of grinding surface | 22 |

Figures 5, 5*a*, 6 and 6*a*, Plate XXVII, give crown and mesial views of the second upper molar of *B. occidentalis* and *B. bison*, respectively, for comparison. Attention should be directed particularly to the relative size of these teeth, which form a well-graded series from *B. willistoni*, the largest, to *B. bison*, the smallest. While the enamel pattern of the crown is in general the same in all, yet sufficient differences in detail are noticeable to make them specifically distinct. The relative size and the shape of the metastyl, mesostyl and parastyl are distinctly different in each case, as well as the secondary crochets between them. The metacone and paracone likewise show similar variations. The metaloph is marked by a decided crochet. The hypocone and protoconule are lacking in the other two species, while the crochet is apparently wanting in all. These also show differences in form, though less marked than in the other portions just mentioned.

Perhaps the greatest dissimilarity is displayed by the protocone, which in fact affords an easy means of identification. In *B. willistoni* the protocone is very large and lies in a large reëntrant angle between the hypocone and the protocone, while the whole contour of the protocone is conspicuously tortuous. In side view the protocone forms a long fluted pillar extending quite to the base of the tooth. In *B. occidentalis* it is not only shorter, but lacks the vertical groove on its exposed surface. In *B. bison* a corresponding groove is present, but shallower, and the whole structure ends at approximately the lower level of the crown of the tooth. In short, the protocone differs so decidedly in each of these three cases as to leave no doubt of the specific distinction of the three forms represented.

I here wish to express my thanks and appreciation to Dr. H. H. Lane for his assistance and advice in the final arrangement of this paper.

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## A NEW LOCALITY FOR BISON OCCIDENTALIS.

In the fall of 1921, Professor Landrum, then superintendent of the high school at Atwood, Rawlins county, Kansas, called my attention to a deposit of "old bones" which he said were washed out and exposed in great numbers on the east bank of a small stream called Burntwood creek, about nine miles north of McDonald, three miles east of the line between Rawlins and Cheyenne counties, and forty miles east of the Kansas-Colorado state line.

While attending the University here, Professor Landrum assisted me in the paleontological laboratory, so when he assured me the bones were not of any modern animal, but crumbled easily, and were very brittle, I concluded that the exposure was well worth investigating.

The following July, accompanied by two students, Raymond Hall and Neil Thornburg, I had opportunity to visit the bone bed, when on our way to the Hays Springs fossil quarry at Agate, Neb. As our time in Rawlins county was limited to ten days, five were spent in an examination of the exposures around Atwood and five in actual work in the quarry. This did not allow any extensive excavating, but enough was cleared to show that this deposit constitutes the most extensive and richest deposit of Pleistocene fossils so far reported from Kansas. A good representative collection was secured, including three skulls, many limb bones, and innumerable teeth.

The deposit shows a heterogeneous accumulation of many animals, with little association of skeletal parts, and in only two or three instances were vertebræ and skulls found connected, or parts of the limb bones in position. Teeth seemed to be scattered throughout the whole bed, and the skulls have in most cases disintegrated. The proximal ends of humeri and femora are nearly always badly broken up, and few pelvic bones are sound enough to remove, even with the help of shellac as a hardener.

Mr. George Hufman, who owns the property on which the bone bed is located, visited us frequently, and generously invited us to collect all the material, so the following year (1923) I revisited the locality with two students, Mr. D. H. Sprong, Jr., and Neil Coleman, as assistants. During this trip to the quarry a great amount of material was secured, but no complete skeleton was found. Many very fine complete lower limbs were gathered, both back and front, but few perfect femora, scapulæ or humeri could be found.

Two fine skulls were shipped *en bloc*, the horn cores and teeth of which represent typical *Bison occidentalis*, and I have no hesitancy in ascribing the whole herd to that species.

The deposit was first noticed some thirty-eight years ago by Mr. Lily, of Atwood, who then resided on a farm close by, and who tells me it was known locally as Bone Hill. At that time the face of the wall formed by the bones was nearly perpendicular and from ten to twelve feet high and twenty feet long. To-day it shows a sloping front with a width of twenty-five feet, extending clear back to the older Republican beds, and has a length of seventy-five feet. There appears to have been a general disturbance of the material after its first deposition, due probably to the effects of water from the Burntwood, which now meanders at the base of the deposit, but some twenty feet below.

The deposit is situated at the base of an abrupt escarpment composed of the Republican beds, which extends here in a straight north-and-south line for a distance of two miles or more, with a height of thirty-five to forty feet.

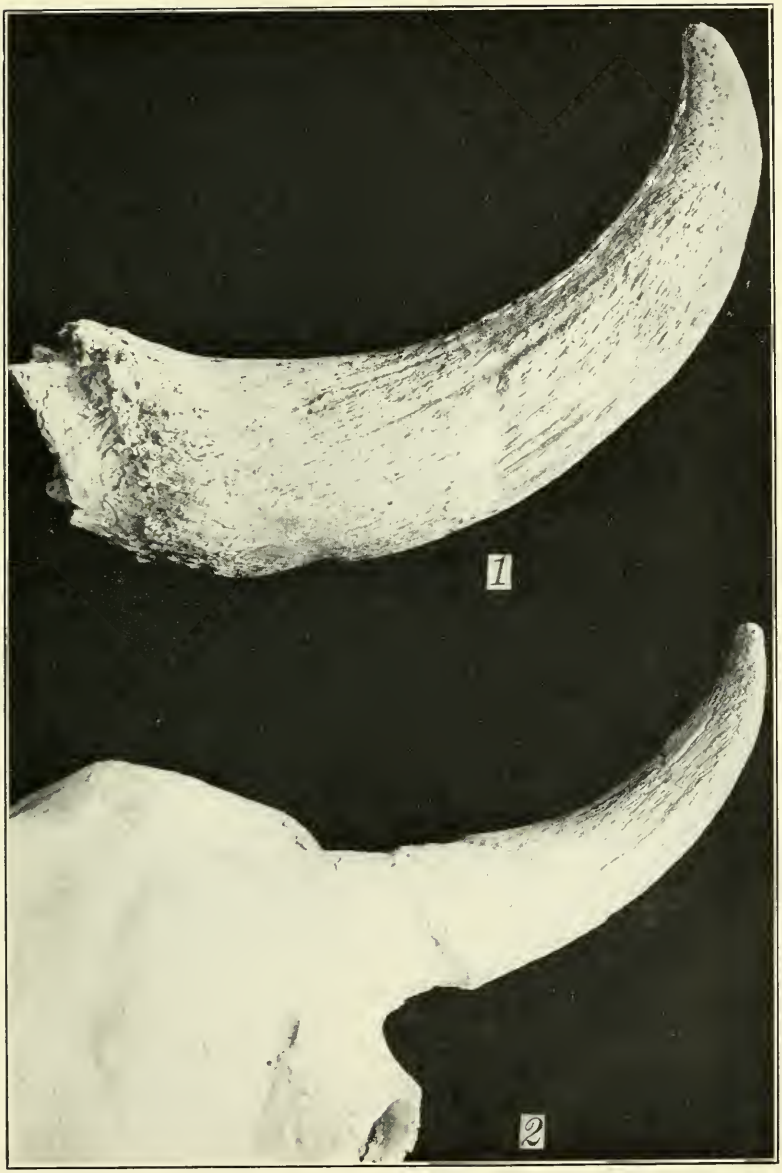
The number of animals that perished here could not have been less than 150, while scattering bones outcrop on the same level for a distance of half a mile downstream.

The deposit is not yet exhausted, and further work will be continued as time and opportunity admits.

## PLATE XXVI.

FIG. 1. Horn core of *Bison willistoni*, not quite one-third natural size.
FIG. 2. Horn core of *Bison occidentalis*, not quite one-third natural size.

PLATE XXVI.



## PLATE XXVII.

FIG. 3. Crown view of remnant of the last upper molar of *Bison willistoni*, with portions of the maxillary.

FIG. 3*a*. Lateral view of the same tooth.

FIG. 4. Crown view of the second upper molar, provisionally assigned to a young individual of *Bison willistoni*.

FIG. 4*a*. Lateral view of the same tooth.

FIG. 5. Crown view of the second upper molar of *Bison occidentalis*.

FIG. 5*a*. Lateral view of the same tooth.

FIG. 6. Crown view of the second upper molar of *Bison bison*.

FIG. 6*a*. Lateral view of the same tooth.

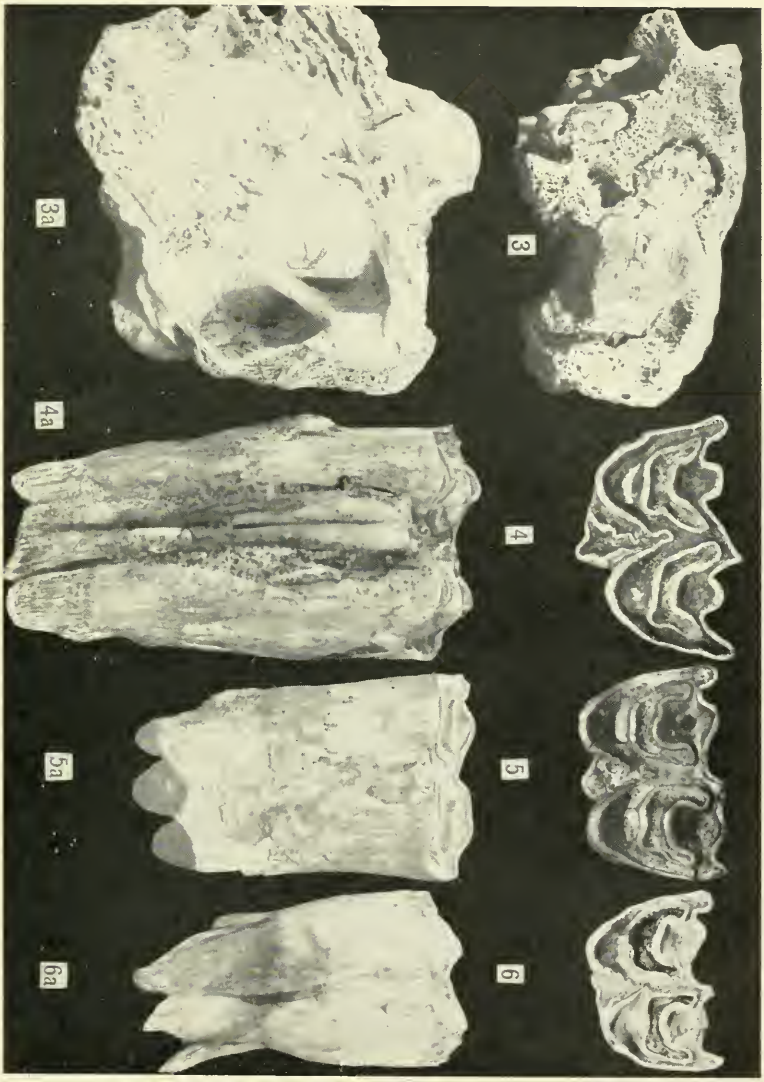
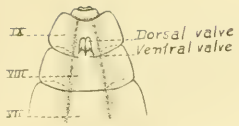



PLATE XXVII.

# PLATE LXII.

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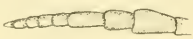

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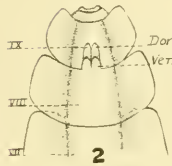


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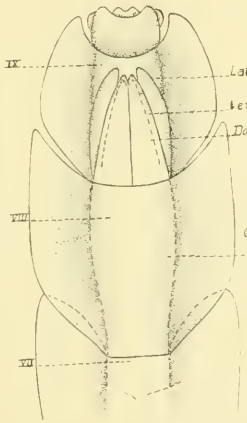


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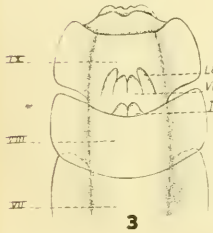


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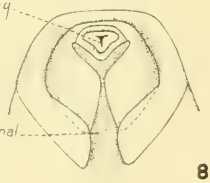


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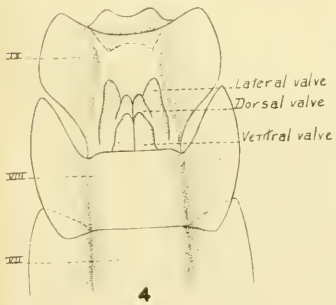


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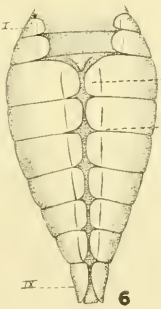


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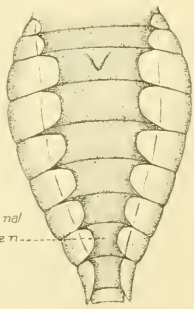


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"Common Injurious Insects of Kansas." V. L. Kellogg.

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"The More Destructive Grasshoppers of Kansas." S. J. Hunter (with F. H. Snow).

"Scale Insects Injurious to Orchards." S. J. Hunter.

"Alfalfa, Grasshoppers, Bees; Their Relationships." S. J. Hunter.

"The Honey Bee and Its Food Plants in Kansas." S. J. Hunter.

"The Green Bug and Its Natural Enemies." S. J. Hunter.

"Report of Results of University Research Commission on Horse Plague." S. J. Hunter, A. L. Skoog, W. K. Trimble, N. P. Sherwood.

"Orchard Problems and How to Solve Them." H. B. Hungerford.

"Studies in Kansas Insects." Bulletin 11.

1. Grasshoppers; Melanopli of Kansas. P. W. Claassen.
2. Grasshoppers; Œdipodinæ of Kansas. R. H. Beamer.
3. Dragonflies of Kansas. C. H. Kennedy.
4. Scale Insects Injurious to Fruit and Shade Trees. P. B. Lawson.
5. Spring Cankerworm and Its Control. W. H. Wellhouse.

Applications should be made to the State Entomologist, University of Kansas.

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Bulletin 3, 1917..Oil and Gas Resources of Kansas; exhausted.
Bulletin 4, 1918..Environment of Camp Funston.
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Bulletin 6, 1918..Oil and Gas Resources of Kansas.
Part 1. General Geology of Oil and Gas.
1920. Part 2. Geology of Kansas.
Part 5. Allen and Neosho Counties.
Part 6. Wilson and Montgomery Counties.
Bulletin 7, 1921..Geology of El Dorado Oil and Gas Field.
Bulletin 8, 1921..Economic Geology of the Arkansas City District.
Bulletin 9, 1924..Geology and Invertebrate Paleontology of the Comanchean and "Dakota" Formation of Kansas.

MINERAL RESOURCES OF KANSAS.

Report for 1897, 1898, 1900-'01, 1902; exhausted.
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